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# REVISION OF THE TRIPTERYGIID FISH GENUS *HELCOGRAMMA*, INCLUDING DESCRIPTIONS OF FOUR NEW SPECIES

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## ABSTRACT

*Helcogramma* includes 12 species: *H. billi* n. sp., *H. capidata* Rosenblatt, 1960, *H. chica* Rosenblatt, 1960, *H. decurrens* McCulloch and Waite, 1918, *H. ellioti* (Herre, 1944), *H. fuscopinna* Holleman, 1982, *H. hudsoni* (Jordan and Seale, 1906), *H. obtusirostris* (Klunzinger, 1871), *H. rhinoceros* n. sp., *H. springeri* n. sp., *H. steinitzi* Clark, 1979, and *H. striata* n. sp. *Helcogramma trigloides* is regarded as a species inquirendum; no specimens of this species were found. The four new species are figured in whole lateral view. All species are figured in detailed head views to show characteristics of cephalic sensory canals (dorsal and ventral). My study confirms that all members of the family Tripterygiidae share a single specialization: Loss of the posteriormost spine of the second dorsal fin. Members of the genus *Helcogramma* share the following character: A single lateral line, composed of 12–37 pored scales curving down from the posttemporal bone, behind the pectoral fin and continuing along the midline of the body. Some characters of the osteology of *Helcogramma* are discussed and figured in the diagnosis of the genus.

Members of the genus *Helcogramma* McCulloch and Waite comprise small species (less than 60mm SL adult size) that live on rock surfaces and under ledges (Zander and Heymer, 1970; 1976; pers. obs.). They are common in depths less than 10 m, although on the Zululand Coast they are common at depths up to 18 m (Holleman pers. comm.). *Helcogramma* species spawn on algal-covered rock surfaces and the larvae are occasionally taken with adults (Hansen, pers. obs.). Although tripterygiid fishes are ubiquitous, they are often overlooked or given scant attention in field guides and checklists. This is probably due to their small size and cryptic coloration. However, the males of most tripterygiid species display bright nuptial coloration, and can easily be seen during the spawning season.

The 12 species of *Helcogramma* occur mainly in the Indo Pacific (one species is found in the Southeastern Atlantic) and they compose the second largest genus of tripterygiid fishes. *Enneapterygius,* also Indo Pacific in distribution, comprises more than 20 species (Holleman, pers. comm.). *Enneanectes,* from the Atlantic, was revised by Rosenblatt (1960) and includes 5 species. No other tripterygiid genera have been revised.

The genus *Helcogramma* is in need of definition. Studies of *Helcogramma* have been regional (De Beaufort and Chapman, 1951; Schultz, 1960; Clark, 1980; Holleman, 1982). *Helcogramma* was first described (McCulloch and Waite, 1918) from a "single somewhat damaged specimen" of the type species, *H. decurrens.* The description was one short sentence and it did not clearly define the genus. Rosenblatt defined *Helcogramma* (in Schultz, 1960) using a combination of characters: single lateral line, single anal spine, palantine teeth, and pelvic rays united by a membrane for part of their length. Although this definition is applicable to all described species of *Helcogramma,* it also includes members of an undescribed genus (Rosenblatt, 1959) and several species placed in the genera *Enneapterygius* and *Tripterygion.* Therefore I am redefining the genus to exclude all other genera, and include descriptions of all species I recognize as *Helcogramma.*

Table 1a. Frequency distribution of dorsal spines and rays, and segmented anal rays in six species of *Helcogramma* by locality (All specimens have 3 first dorsal spines)

| | Second dorsal | | | | | | Third dorsal | | | | | Anal rays | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species and locality | XII | XIII | XIV | XV | XVI | x̄ | 9 | 10 | 11 | 12 | x̄ | 17 | 18 | 19 | 20 | 21 | 22 | 23 | x̄ |
| *H. billi* | | | | | | | | | | | | | | | | | | | |
| Sri Lanka: Trincomalee | | 36 | 6 | | | 13.14 | 3 | 23 | 16 | | 10.31 | 1 | 6 | 25 | 10 | | | | 19.05 |
| *H. capidata* | | | | | | | | | | | | | | | | | | | |
| Marianas: Maug; Guam | | 2 | 5 | 1 | | 13.88 | | 1 | 7 | | 10.88 | | | | 5 | 3 | | | 20.38 |
| Carolines: Ponape | | 1 | 6 | | | 13.86 | | 1 | 6 | | 10.88 | | | | 4 | 3 | | | 20.43 |
| Marshalls: Bikini, Eniwetok, Rongelap & Taka I | | 1 | 10 | 1 | | 14.00 | | 2 | 10 | | 10.83 | | | 1 | 4 | 7 | | | 20.50 |
| Gilberts: Onotoa Atoll | | 1 | 4 | | | 13.80 | | 1 | 2 | 2 | 11.20 | | | | 1 | 4 | | | 20.80 |
| Phoenix I: Hull I | | | 2 | 1 | | 14.33 | | | 3 | | 11.00 | | | 2 | 1 | | | | 19.33 |
| *H. chica* | | | | | | | | | | | | | | | | | | | |
| Sri Lanka: Trincomalee | | 1 | | | | | | 1 | | | | | 1 | | | | | | |
| Taiwan: Teh. | | 1 | 2 | | | 13.67 | 1 | 1 | 1 | | 10.00 | | 1 | 1 | 1 | | | | 19.00 |
| Japan: Miyake jima | | | 2 | 1 | | 14.33 | | 1 | 1 | 1 | 11.00 | | 1 | | 2 | | | | 19.33 |
| Philippines: Cocoro & Apo | | | 13 | | | 14.00 | 11 | 2 | | | 9.15 | | 2 | 9 | 2 | | | | 19.00 |
| Marianas: Guam | | | | 5 | | 15.00 | | 4 | 1 | | 10.20 | | 3 | 1 | 1 | | | | 18.60 |
| Phoenix I: McKean Hull | | | | 2 | 1 | 15.33 | 2 | | 1 | | 9.67 | | | | 3 | | | | 20.00 |
| Samoan I: Tutuila Rose | | | 4 | 6 | | 14.60 | 1 | 7 | 2 | | 10.10 | | | 6 | 4 | | | | 19.40 |
| *H. decurrens* | | | | | | | | | | | | | | | | | | | |
| S. Australia: Pt. Peron | | 1 | 1 | | | 13.50 | | 1 | 1 | | 10.50 | | | | 2 | | | | 20.00 |
| S. Australia: Nt. Pt. & Cape Freycinet | 1 | 26 | 10 | | | 13.24 | | 12 | 23 | 2 | 10.73 | 1 | | 4 | 27 | 5 | | | 20.03 |
| S. Australia: Gulf St. Vincent | | | 1 | | | | | | 1 | | | | | | | 1 | | | |
| *H. ellioti* | | | | | | | | | | | | | | | | | | | |
| India: Trivandrum | | 7 | | | | 13.00 | 7 | | | | 9.00 | | 7 | | | | | | 18.00 |
| India: Madras & Vizingapatam | 2 | 4 | 1 | | | 12.86 | 3 | 3 | | | 9.50 | 1 | 4 | 2 | | | | | 18.14 |
| Sri Lanka: Trincomalee | | 1 | | | | | | | 1 | | | | | | 1 | | | | |
| Ryukyus: Okinawa | | | 1 | | | | | | 1 | | | | | | | 1 | | | |
| Philippines: Apo, Cocoro | | 7 | 26 | | | 13.79 | | 1 | 28 | 4 | 11.09 | | | | 7 | 24 | 1 | | 10.81 |
| Neth. Indies: Ambon, Saparua | | 2 | 6 | | | 13.75 | | 1 | 6 | 1 | 11.00 | | | | 4 | 3 | 1 | | 20.63 |
| New Guinea: Tobriand, Muschu I | | 2 | 6 | 1 | | 13.89 | | 4 | 5 | | 10.56 | | 1 | 1 | 1 | 6 | | | 20.33 |
| Solomons: (Savo and unspecified) | | 1 | 5 | | | 13.83 | | | 6 | | 11.00 | | | | 5 | 1 | | | 20.17 |
| N. Caledonia & N. Hebrides | | | 3 | | | 14.00 | | | 3 | | 11.00 | | | | 1 | 2 | | | 20.67 |
| Australia: One Tree I | | | 9 | | | 14.00 | | 1 | 7 | 1 | 11.00 | | | | 2 | 5 | 2 | | 21.00 |

Table 1a. Continued

| | Second dorsal | | | | | | Third dorsal | | | | | Anal rays | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species and locality | XII | XIII | XIV | XV | XVI | x̄ | 9 | 10 | 11 | 12 | x̄ | 17 | 18 | 19 | 20 | 21 | 22 | 23 | x̄ |
| Fiji & Tonga: Nivatobutabu, Vuro I | | 2 | 6 | | | 13.75 | | 1 | 7 | | 10.88 | | | 1 | 1 | 6 | | | 20.63 |
| Samoa: Tutuila | | 2 | 4 | | | 13.67 | | | 6 | | 11.00 | | | | | 6 | | | 21.00 |
| *H. fuscopinna* | | | | | | | | | | | | | | | | | | | |
| Yemen: Aden | | | 2 | | | 14.00 | | 1 | 1 | | 10.50 | | | | 2 | | | | 20.00 |
| E. Africa: Kenya & Sodwana Bay | | 1 | 3 | | | 13.75 | | | 2 | | 11.00 | | | | 2 | | | | 20.00 |
| Comores: Chesterfield | | | 5 | | | 14.00 | | 1 | 2 | 2 | 11.20 | | | | 2 | 3 | | | 20.60 |
| Comores: Aldabra Atoll | | | 3 | | | 14.00 | | | 3 | | 11.00 | | | | 1 | 2 | | | 20.67 |
| Mauritius | | | | 1 | | | | | 1 | | | | | | | 1 | | | |
| Chagos: Arros I | | | 5 | 1 | | 14.17 | | 1 | 5 | | 10.83 | | | | 1 | 5 | | | 20.83 |
| Japan: Miyake jima | | | 6 | | | 14.00 | | | 6 | | 11.00 | | | | 3 | 3 | | | 20.50 |
| Japan: Danjo I | | | | 8 | | 15.00 | | 5 | 3 | | 10.38 | | | | | 6 | 2 | | 21.25 |
| Taiwan: Ch'uan-fan-shih | | | | 13 | 1 | 15.07 | | 2 | 11 | 1 | 10.93 | | | | | 7 | 7 | | 21.50 |
| Philippines: Cuyo, Apo I | | | 15 | | | 14.00 | | 1 | 14 | | 10.93 | | | 4 | 10 | 1 | | | 19.80 |
| New Guinea: Tobriand I | | 3 | | | | 13.00 | | 1 | 2 | | 10.67 | | | 1 | 2 | | | | 19.67 |

Table 1b. Frequency distribution of dorsal spines and rays, and segmented anal rays in six species of *Helcogramma* by locality (All specimens have 3 first dorsal spines)

| | Second dorsal | | | | | | Third dorsal | | | | | Anal rays | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species and locality | XII | XIII | XIV | XV | XVI | x̄ | 9 | 10 | 11 | 12 | x̄ | 17 | 18 | 19 | 20 | 21 | 22 | 23 | x̄ |
| *H. hudsoni* | | | | | | | | | | | | | | | | | | | |
| Banda Sea: Tiur I | | | 1 | | | | 1 | | | | | | | 1 | | | | | |
| N. Australia: Arnhem, Yirrhala Reef | | 2 | | | | 13.00 | | | 2 | | 11.00 | | | 2 | | | | | 19.00 |
| Samoa: Tutuila | | 4 | 4 | | | 13.50 | | 6 | 2 | | 10.25 | | 2 | 6 | | | | | 18.75 |
| *H. obtusirostris* | | | | | | | | | | | | | | | | | | | |
| Ascension I | | 3 | 11 | | | 13.79 | | 7 | 7 | | 10.50 | | | 14 | | | | | 19.00 |
| St. Helena I | | | 7 | | | 14.00 | | | 7 | | 11.00 | | | 7 | 1 | | | | 19.13 |
| Red Sea: Difnein I | | 3 | | | | 13.00 | | 3 | | | 10.00 | | 3 | | | | | | 18.00 |
| S.E. Africa: Zululand & Latham I | | 2 | 11 | | | 13.85 | | 7 | 6 | | 10.46 | | 2 | 11 | | | | | 18.85 |
| Comores: Grand Comore & Aldabra Atoll | | | 9 | | | 14.00 | | 2 | 7 | | 10.78 | | | 9 | | | | | 19.00 |
| Madagascar: E. Amboriobe | | | 1 | | | | | | 1 | | | | | 1 | | | | | |
| St. Brandons Shoals | | 5 | 3 | | | 13.38 | | 2 | 6 | | 10.75 | | | 8 | | | | | 19.00 |
| S. India: Gulf of Mannar | 1 | 3 | | | | 12.75 | 3 | 1 | | | 9.25 | | | 4 | | | | | 19.00 |
| Sri Lanka: Trincomalee | | 20 | 5 | | | 13.20 | 3 | 17 | 4 | 1 | 10.12 | | 5 | 20 | | | | | 18.80 |
| Thailand: Similan I | | 2 | 5 | | | 13.00 | | | 2 | | 11.00 | | | 2 | | | | | 19.00 |
| Sumatra: Malacca Strait | | 1 | | | | | | | 1 | | | | | | 1 | | | | |
| Southern Japan: Danjo I and Okinawa | | | 4 | 3 | | 14.43 | | 1 | 6 | | 10.86 | | | | 7 | | | | 20.00 |
| New Guinea: Papua Neth. Indies, Ambon | | 2 | 4 | | | 13.67 | | | 6 | | 11.00 | | 1 | 5 | | | | | 18.83 |
| Taiwan: Ch'uan-fan-shih | | | 1 | | | | | | 1 | | | | | | | | | | |
| *H. rhinoceros* | | | | | | | | | | | | | | | | | | | |
| Philippines: Putic, Cocoro | | | 4 | 10 | | 14.71 | | 3 | 9 | 2 | 10.93 | | | 1 | 11 | 2 | | | 20.07 |
| Solomon I: Savo I | | | 1 | | | | | 1 | | | | | | 1 | | | | | |
| *H. springeri* | | | | | | | | | | | | | | | | | | | |
| Indonesia: Java Sea | | 2 | | | | | | | 2 | | 11.00 | | | | 2 | | | | 20.00 |
| Neth. Indies: Ambon | | 22 | | | | 13.00 | | | 22 | | 11.00 | | | 18 | 4 | | | | 19.18 |
| New Guinea: Papua | | 3 | | | | 13.00 | | | 3 | | 11.00 | | | | 3 | | | | 20.00 |
| New Hebrides: Espirito Santos | | 1 | | | | 13.00 | | | 1 | | | | | | 1 | | | | |
| *H. steinitzi* | | | | | | | | | | | | | | | | | | | |
| Red Sea: N. Red Sea, Ethiopia | 5 | 51 | 6 | | | 13.02 | | 14 | 40 | 2 | 10.79 | | | 10 | 39 | 3 | | | 19.87 |

Table 1b. Continued

| Species and locality | Second dorsal | | | | | | Third dorsal | | | | | Anal rays | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | XII | XIII | XIV | XV | XVI | x̄ | 9 | 10 | 11 | 12 | x̄ | 17 | 18 | 19 | 20 | 21 | 22 | 23 | x̄ |
| *H. striata* | | | | | | | | | | | | | | | | | | | |
| Sri Lanka: Trincomalee | | 5 | 7 | | | 13.58 | | 1 | 10 | 1 | 11.00 | 1 | | 1 | 8 | 2 | | | 19.83 |
| Japan: Miyake jima | | | 2 | | | 14.00 | | | 1 | 1 | 11.50 | | | | 1 | | 1 | | 21.00 |
| Ryukyu: Okinawa | | | 1 | | | | | 1 | | | | | | | 1 | | | | |
| Taiwan: Ch'uan-fan-shih | | 8 | 28 | 3 | | 13.87 | | 8 | 24 | 7 | 10.97 | | | | 5 | 13 | 18 | 2 | 21.45 |
| Philippines: Bantangas, Negros & Cebu | | 1 | 12 | | | 13.92 | | 1 | 12 | | 10.92 | | | | 3 | 8 | 1 | 1 | 21.00 |
| Neth. Indies: Ambon, Saparua | 2 | 9 | 9 | | | 13.35 | 2 | 10 | 8 | | 10.30 | | 1 | 3 | 12 | 5 | 1 | | 20.09 |
| New Ireland | | 5 | | | | 13.00 | | | 5 | | 11.00 | | | 2 | 3 | | | | 19.60 |
| Solomons: Guadalcanal | 1 | 1 | 1 | | | 13.00 | | 1 | 1 | 1 | 11.00 | | | 1 | 1 | 1 | | | 20.00 |
| N. Australia: Kendrew I | | | 2 | 1 | | 14.33 | | | 2 | 1 | 11.33 | | | | | 2 | 1 | | 21.33 |

## MATERIALS AND METHODS

Measurements were made with dividers and metric ruler using the methods of Hubbs and Lagler (1958), with the exception of the following: Seventh pectoral ray length was measured from the distal end of the pectoral radial adjacent to the seventh pectoral ray (counting from the bottom) to the distal tip of the ray; upper jaw length was measured from the anterior margin of the tip of the upper lip to the posteriormost edge of the maxilla; second dorsal base length was measured from the small bump created by the distal pterygiophore anterior to the fourth dorsal spine base (not including the membrane following); third dorsal base length was measured from the small bump created by the distal pterygiophore anterior to the first segmented dorsal ray, to the last segmented dorsal ray base (not including the membrane following); distance from the pectoral to anal spine (P1-anal fin) was measured as the distance from the base of the left first pectoral ray (counting from the bottom) to the anal spine. Measurements and counts were made on the left side of specimens whenever possible.

The following abbreviations for measurements were used: HL = head length; SL = standard length; ML = upper jaw length; and N = number of specimens.

In the measurement section of each species description, the measurements are recorded as %SL, and are given as: mean %SL followed by the range of %SL in parentheses. In the material examined sections, SL in mm is recorded in parentheses after the number of males, females, or total number of specimens. Statistical methods follow Sokal and Rolf (1969). Linear regression equations and their correlation coefficients were computed using Minitab statistical computing system (Ryan et al., 1976).

Counts of dorsal-, anal-, caudal-, and pectoral-fin elements were taken from the whole preserved specimens whenever possible (Table 1a, b). If there were dorsal or anal elements missing or broken on the specimen, it was radiographed, and these counts were taken from the radiographs.

The last dorsal and anal fin rays were often divided to the base, and these were counted as a single element if they were attached to a single pterygiophore.

The anteriormost vertebra bearing a well-developed haemal spine is the anteriormost caudal vertebra. Counts of caudal-fin elements are reported as a formula: dorsal procurrent rays + segmented rays + ventral procurrent rays.

The number of cephalic sensory pores in *Helcogramma* (Fig. 1) is difficult to standardize. I have considered only large adult specimens (>25.0 mm SL) in describing pore patterns because the pore systems become more branched and the pore number increases during ontogeny but are fully developed by about 25 mm. I have used the two anteriorly extending central canals from the occipital canal as references, and designated species shown in Figures a, c, f, k, and l as "simple"; b, d, e, h, and i as "moderately complex"; and g and j as "complex." Although this character is useful in a relative sense, it should be noted that individual variation is great between and among populations in a species. The actual patterns depicted show only general trends.

The mandibular pore series (Fig. 2) are considered to include those sensory pores issuing from the dentary bone that are anterior to a line drawn vertically down from the posterior edge of the maxilla. The mandibular pore formula is reported as: right mandibular pores + central mandibular pores (those immediately behind the jaw symphysis) + left mandibular pores. The mandibular pore series proved to be a consistent character within species. A range of pore values was given when a variation was noted.

The lateral-line pored scales are those scales in the lateral line that bear tubes, or pores for sensory pit organs. The lateral line begins just posterior to the posttemporal bone and ends along the midline of the body. Missing lateral-line scales were included in the lateral-line pored scale count (Table 2a, b).

Color patterns are described from live, freshly dead, or preserved specimens. Each description, unless otherwise indicated, is a composite of observations made on several specimens. Bands and bars refer to vertical markings, stripes to horizontal markings.

Osteological observations were made on specimens cleared and stained by the method of Dingerkus and Uhler (1977). I have cleared and stained specimens of all species.

Under the material examined sections of each species description data are divided into general localities, and given as follows: Specimen number, sex (SL in mm), locality, collector, date.

The following abbreviations for institutions and collections are used: AMNH—American Museum of Natural History, New York; AMS—Australian Museum, Sydney; ANSP—Academy of Natural Sciences, Philadelphia; BMNH—British Museum (Natural History), London; BPBM—Bernice P. Bishop Museum, Honolulu; CAS—California Academy of Sciences, San Francisco (catalog numbers start with SU); CMFRI—Central Marine Fisheries Research Institute (Mandapam Camp, India); FMNH—Field Museum of Natural History, Chicago; MCZ—Museum of Comparative Zoology, Harvard University, Cambridge; NMNH—National Museum of Natural History, Washington, D.C. (catalog numbers start with USNM); RNH—Rijkmuseum van Natuurlijke Historie, Leiden; SAMA—South Australian Museum, Adelaide (catalog numbers begin with F); SNHM—Stanford Natural History Museum, Stanford; UG—University of Guam collection of Fishes, Guam; ZMA—Institute of Voor Taxono-

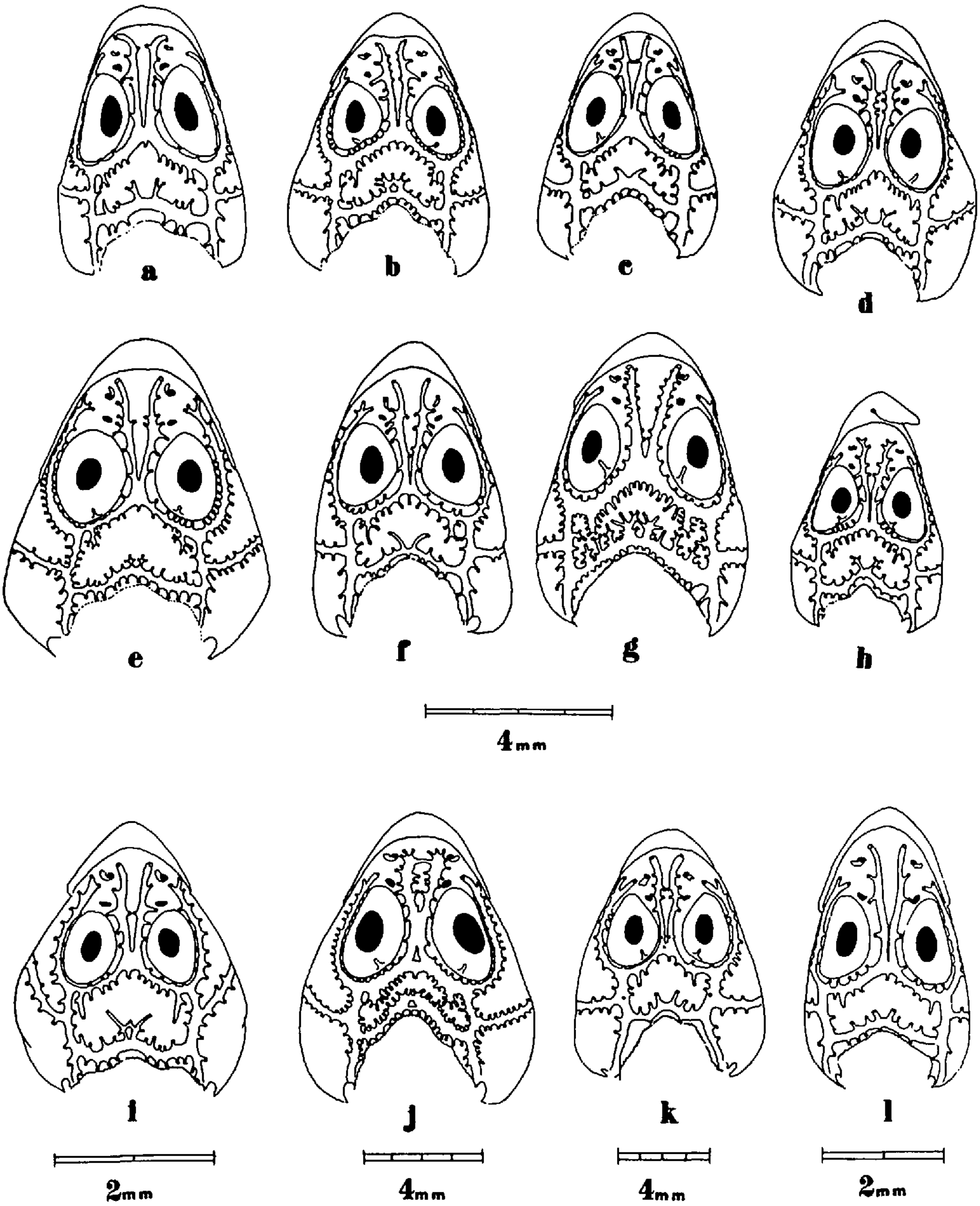

Figure 1. Cephalic sensory pore system in 12 Helcogramma species (dorsal view): (a) *H. striata*, (b) *H. obtusirostris*, (c) *H. billi*, (d) *H. ellioti*, (e) *H. hudsoni*, (f) *H. capidata*, (g) *H. decurrens*, (h) *H. rhinoceros*, (i) *H. chica*, (j) *H. fuscopinna*, (k) *H. steinitzi* (l) *H. springeri*.

mische Zoologie, (Zoological Museum), Amsterdam; ZMB—Institut fur Spezielle Zoologie, Berlin (catalog numbers begin with OR).

The synonymies include primary and secondary synonyms, but only the initial reference to the latter.

To arrive at the definitions of the Tripterygiidae and *Helcogramma* I examined specimens of all tripterygiid genera, especially specimens of an undescribed genus (Rosenblatt, 1959[1]) I consider to be closely related to *Helcogramma*.

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[1] Rosenblatt, R. H. 1959. A revisionary study of the blennoid fish family Tripterygiidae (unpublished doctoral dissertation, Univ. Cal. Los Angeles).

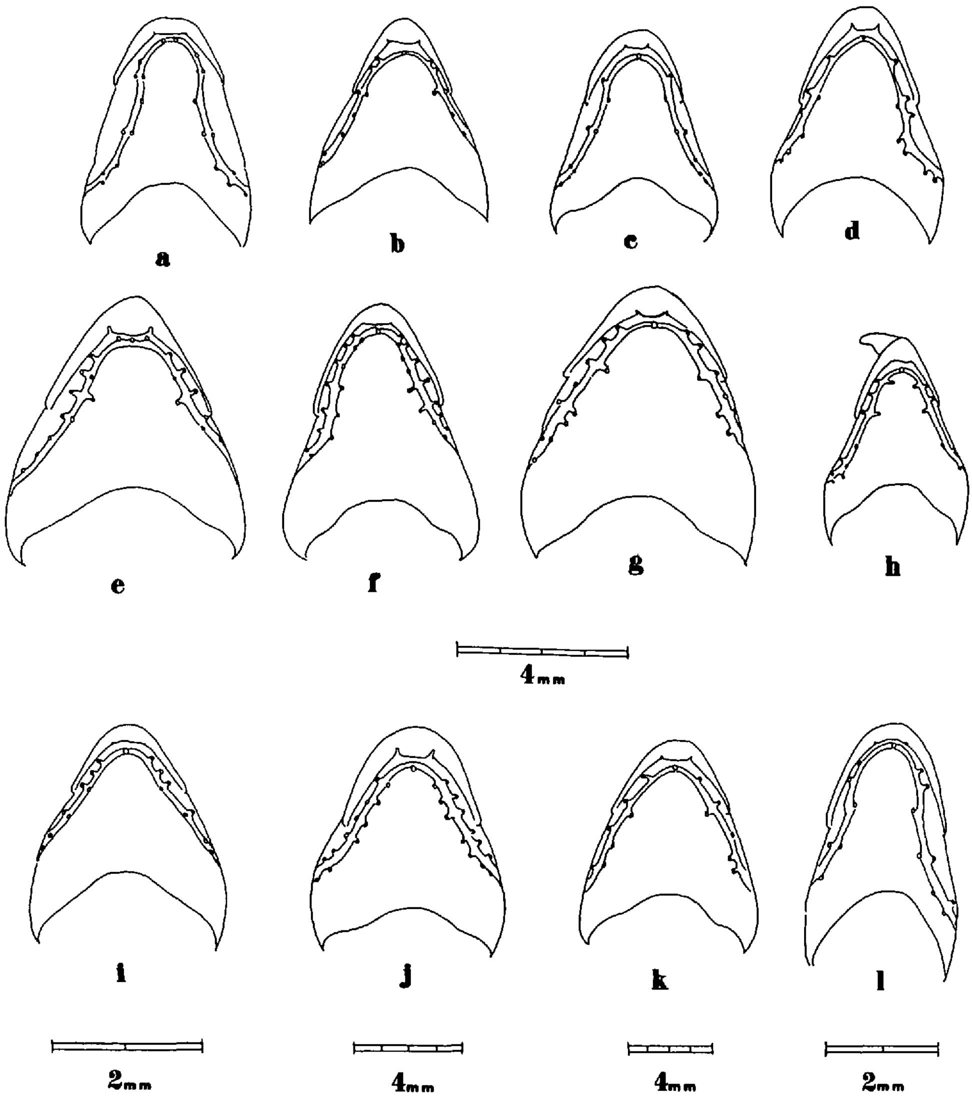


Figure 2. Mandibular sensory pore system in 12 Helcogramma species (ventral view): (a) *H. striata* (b) *H. obtusirostris,* (c) *H. billi,* (d) *H. ellioti,* (e) *H. hudsoni,* (f) *H. capidata,* (g) *H. decurrens,* (h) *H. rhinoceros,* (i) *H. chica,* (j) *H. fuscopinna,* (k) *H. steinitzi,* (l) *H. springeri.*

On the distribution maps, the black circles and triangles are localities from which specimens have been recorded or from which I saw material; the black circles and triangles with stars in them are type localities.

## CLASSIFICATION OF *HELCOGRAMMA*

The family Tripterygiidae comprises 14 valid genera and more than 100 valid species. The described genera presently considered valid are: *Axoclinus* Fowler, 1944; *Brachynectes* Scott, 1957; *Enneanectes* Jordan, 1895; *Enneapterygius* Ruppell, 1835; *Forsterygion* Whitley and Phillips, 1939; *Gilloblennius* Whitley and Phillips, 1939; *Helcogramma* McCulloch and Waite 1918; *Lepidoblennius* Steindackner, 1867; *Norfolkia* Fowler, 1953; *Notoclinops* Whitley, 1930; *Notoclinus*

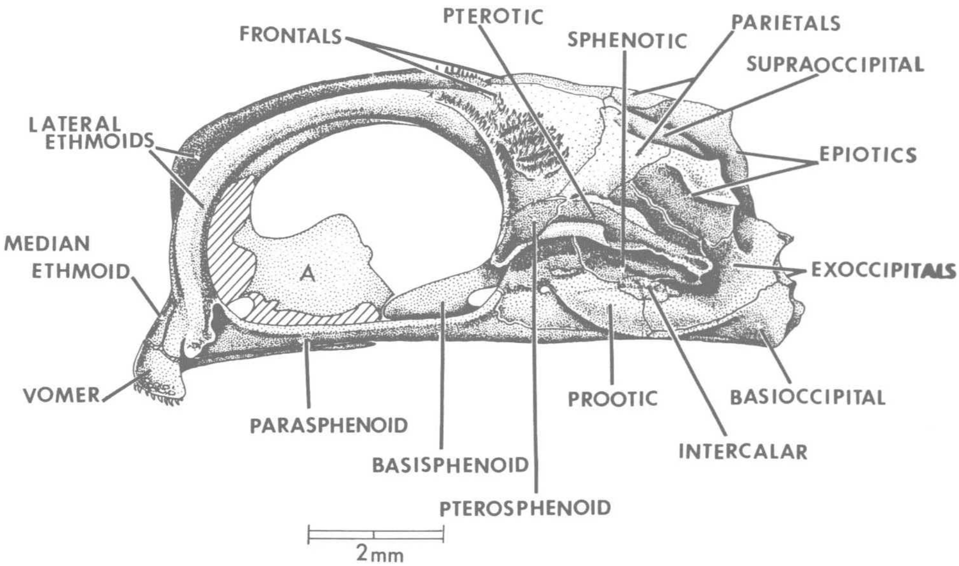


Figure 3. Neurocranium of *Helcogramma fuscopinna* (lateral view). (A) Septal bone: Partially ossified interorbital septum. Cartilage indicated with bold stripes. Note teeth on vomer.

Gill, 1893; *Trianectes* McCulloch and Waite, 1918; *Tripterygion* Risso, 1826; and *Vauclusella* Whitley, 1931.

Members of the family Tripterygiidae are unique among the fishes of the suborder Blennioidei (George and Springer, 1980) sharing the following specialization: Loss of the posteriormost spine of the second spinous dorsal-fin. All other blennioids have this spine, although it may be greatly reduced as in *Entomacrodus nigricans* Gill (Springer, 1968: fig. 10). In addition, most members of the family Tripterygiidae possess a "septal bone"; partial ossification of the interorbital septum (Springer and Freihofer, 1976; Holleman, 1982) not present in any other blennioids (Fig. 3).

## Diagnosis of the Genus *Helcogramma*

*Helcogramma* McCulloch and Waite, 1918 (Type species, *Helcogramma decurrens* McCulloch and Waite, 1918, by original designation).

Dorsal fin III, XII–XVI, 9–12. Anal fin I, 17–23. Pectoral-fin rays 15–17 (16 in >70% of the specimens of each species) ventralmost 6–7 simple and thickened, dorsalmost 1–2 simple, remainder branched. Pelvic fin I (small, embedded), 2; pelvic rays simple, united by membrane ½–⅓ length. Caudal fin 8–10 + 13 + 7–10, 8–12 precaudal +25–29 caudal vertebrae = 34–39 total vertebrae (Fig. 4). Small, leaflike nasal tentacle; orbital tentacle small, may be minute or absent. Dorsal and lateral cephalic sensory canals not covered by bone (Fig. 5B); opening as series of pores. Mandibular sensory canals opening as series of pores: 3–10 + 1–3 + 3–10. Lateral line continuous series of 12–37 pored scales curving down immediately posterior to posttemporal bone behind pectoral-fin base and continuing midlaterally to below second or third dorsal fins or onto caudal peduncle. Total scales in lateral-line series (pored and unpored) 37–42. Head, abdomen, and pectoral-fin base naked; nape and space just below dorsal-fin base scaled in some species. Scales ctenoid, with small subequal ctenii. Jaws with fixed, slightly

Table 2a. Frequency distribution of lateral line tubes in six species of *Helcogramma* by locality

| Species and locality | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | x̄ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. billi* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sri Lanka, Trincomalee | | | | | | | | | | | | | | | | | 1 | 3 | 3 | 9 | 3 | | 2 | | | | | 29.86 |
| *H. capidata* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Marianas: Maug; Guam | | | | | | | | | | 2 | 2 | | 2 | | | | | | | | | | | | | | | 21.33 |
| Carolines: Ponape | | | | | | | | | | 1 | 1 | | 3 | | | | | | | | | | | | | | | 22.00 |
| Marshalls: Bikini, Eniwetok, Rongelap & Taka I | | | | | | | | | | 1 | 1 | 2 | 1 | 2 | 3 | | | | | | | | | | | | | 23.38 |
| Gilberts: Onotoa Atoll | | | | | | | | | | | | | | 2 | 1 | 1 | 1 | | | | | | | | | | | 25.20 |
| Phoenix I: Hull I | | | | | | | | | | | | | | 2 | 1 | | | | | | | | | | | | | 24.33 |
| *H. chica* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sri Lanka: Trincomalee | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | |
| Taiwan: Teh | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | | | | 20.00 |
| Japan: Miyake jima | | | | | | | | | | | | 2 | 1 | | | | | | | | | | | | | | | 22.33 |
| Philippines: Cocoro & Apo | | | | | | | | 3 | 4 | 6 | | | | | | | | | | | | | | | | | | 19.23 |
| Marianas: Guam | | | | | | | | | | | 4 | | 1 | | | | | | | | | | | | | | | 21.40 |
| Phoenix I: McKean, Hull | | | | | | | | | | 1 | 2 | | | | | | | | | | | | | | | | | 20.67 |
| Samoan I: Tutuila, Rose | | | | | | | | | 5 | 5 | | | | | | | | | | | | | | | | | | 19.50 |
| *H. decurrens* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| S. Australia: Pt. Peron | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | | | | | 20.50 |
| S. Australia: N. Pt. & Cape Freycinet | | | | | | | | 4 | 11 | 14 | 3 | 2 | | | | | | | | | | | | | | | | 19.65 |
| S. Australia: Gulf St. Vincent | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | |
| *H. ellioti* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| India: Trivandrum | | | | | | | | | | | | | | | | | | | | | | | 4 | 1 | 1 | 1 | | 33.86 |
| India: Madras & Vizingapatam | | | | | | | | | | | | | | | | | | | | | | | | 2 | 3 | 1 | 2 | 35.38 |
| Sri Lanka: Trincomalee | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | |
| Ryukyus: Okinawa | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | |
| Philippines: Apo, Cocoro | | | | | | | | | | | | 2 | | | 4 | 3 | 6 | 5 | 4 | 6 | 2 | | | | | | | 27.56 |
| Neth. Indies: Ambon | | | | | | | | | | | | | | | 1 | | 1 | | | 1 | | 2 | | | | | | 29.20 |
| New Guinea: Tobriand, Muschu I | | | | | | | | | | | | | | | | | | 1 | | | 1 | 2 | 3 | | | | | 31.71 |
| Solomons: (unspecified) | | | | | | | | | | | | | | | | | | | 1 | | 2 | 1 | 2 | | | | | 31.59 |
| N. Caledonia & N. Hebrides | | | | | | | | | | | | | | | | | | | 1 | 1 | 1 | | | | | | | 30.00 |
| Australia: One Tree I | | | | | | | | | | | | | | | | | | | | | 4 | 3 | | | | | | 31.43 |
| Fiji & Tonga: Nivatobutabu, Vuro | | | | | | | | | | | | | | | | | | | 1 | | 1 | 2 | 2 | 1 | | | | 31.88 |
| Samoa: Tutuila | | | | | | | | | | | | | | | | | | | | | | 1 | 1 | 2 | 1 | 1 | | 34.00 |

Table 2a. Continued

| Species and locality | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | x̄ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. fuscopinna* | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Yemen: Aden | | | | | | | | | | | 1 | | | 1 | | | | | | | | | | | | | | 22.50 |
| E. Africa: Kenya & Sodwana Bay | | | | | | | | | | | | | 1 | 2 | 1 | | | | | | | | | | | | | 24.00 |
| Comores: Chesterfield I | | | | | | | | | | | | 1 | 1 | 1 | | | | | | | | | | | | | | 23.00 |
| Comores: Aldabra Atoll | | | | | | | | | | | | 3 | | | | | | | | | | | | | | | | 22.00 |
| Mauritius | | | | | | | | | | | 1 | | | | 1 | | | | | | | | | | | | | 23.00 |
| Chagos: Arros I | | | | | | | | | | | 1 | 3 | | 1 | 1 | | | | | | | | | | | | | 22.67 |
| Japan: Miyake jima | | | | | | | | | | | | | | | 2 | 2 | | 1 | | 1 | | | | | | | | 26.67 |
| Japan: Danjo I | | | | | | | | | | | | | | | | | 3 | 3 | | | | 1 | 1 | | | | | 28.75 |
| Taiwan: Ch'uan-fan-shih | | | | | | | | | | | | | | | | | 2 | 4 | 1 | 4 | | 2 | 1 | | | | | 29.43 |
| Philippines: Cuyo, Apo I | | | | | | | | | | 1 | 3 | 8 | 2 | 1 | | | | | | | | | | | | | | 21.93 |
| New Guinea: Tobriand I | | | | | | | | | | | | 1 | | 2 | | | | | | | | | | | | | | 23.33 |

Table 2b. Frequency distribution of lateral line tubes in six species of *Helcogramma* by locality

| Species and locality | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | $\bar{x}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. hudsoni* | | | | | | | | | | | | | | | | | | | |
| Banda Sea: Tiur I | | | | | | | | | | 1 | | | | | | | | | |
| N. Australia: Arnhem, Yirrhala Reef | | | | | | | | | | 2 | | | | | | | | | 20.00 |
| Samoa: Tutuila | | | | | | | | | | 1 | 3 | | 3 | | | 1 | | | 22.25 |
| *H. obtusirostris* | | | | | | | | | | | | | | | | | | | |
| Ascension I | | | | | | | | | 2 | 7 | 3 | 1 | | | | | | | 20.23 |
| St. Helena I | | | | | | | | | | 4 | | 2 | 1 | 1 | | | | | 21.38 |
| Red Sea: Difnein I | | | | | | | | | | 1 | 1 | | 1 | | | | | | 21.33 |
| S.E. Africa: Zululand and Latham I | | | | | | | | | 1 | 6 | 1 | 4 | 1 | | | | | | 20.85 |
| Comores: Grand Comore, Aldabra Atoll | | | | | | | | | 1 | 1 | 1 | | | | | | | | 20.00 |
| Madagascar: E. Ambriode | | | | | | | | | 1 | | | | | | | | | | |
| St. Brandons Shoals | | | | | | | | | 1 | 4 | 2 | 1 | | | | | | | 20.38 |
| S. India: Gulf of Mannar | | | | | | | | | | 2 | 2 | 1 | | | | | | | 20.80 |
| S. India: Laccadives | | | | | | | | | 3 | | 4 | 1 | | | | | | | 20.38 |
| Sri Lanka: Trincomalee | | | | | | | | | 3 | 7 | 7 | 2 | 2 | 2 | | | 1 | | 21.21 |
| Thailand: Similan I | | | | | | | | 1 | 1 | | | | | | | | | | 18.50 |
| Sumatra: Malacca Strait | | | | | | | | | | | | | 1 | | | | | | 23.00 |
| Southern Japan: Danjo I and Okinawa | | | | | | | | | | 2 | 1 | 2 | 1 | | | | | | 21.33 |
| New Guinea: Papua, Neth. Indies and Ambon | | | | | | | | 1 | | 3 | 1 | 1 | | | | | | | 20.17 |
| Taiwan: Ch'uan-fan-shih | | | | | | | | | | | 1 | | | | | | | | |
| *H. rhinoceros* | | | | | | | | | | | | | | | | | | | |
| Philippines: Putic, Cocoro | | | | | | | | 3 | 7 | 3 | 1 | | | | | | | | 19.14 |
| Solomons: Savo I | | | | | | | | | | 1 | | | | | | | | | |
| *H. springeri* | | | | | | | | | | | | | | | | | | | |
| Indonesia: Java Sea | | | 2 | | | | | | | | | | | | | | | | 13.00 |
| Neth. Indies: Ambon | | | 15 | 7 | | | | | | | | | | | | | | | 13.32 |
| New Guinea: Papua & Hermit I | | | 4 | | | | | | | | | | | | | | | | 13.00 |
| New Hebrides: Espirito Santos | | 1 | | | | | | | | | | | | | | | | | |
| Solomon I: Bonganville | | | | 1 | | | | | | | | | | | | | | | |
| *H. steinitzi* | | | | | | | | | | | | | | | | | | | |
| Red Sea: North & Ethiopia | | | | | | | | | | | 5 | 7 | 9 | 7 | 13 | 3 | 2 | | 23.72 |

Table 2b. Continued

| Species and locality | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | x̄ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. striata* | | | | | | | | | | | | | | | | | | | |
| Sri Lanka: Trincomalee | | | | | | 1 | 4 | 1 | 2 | 1 | | | | | | | | | 17.78 |
| Japan: Miyake jima | | | | | | | 1 | 1 | | | | | | | | | | | 17.50 |
| Ryukyus: Okinawa | | | | | | | 1 | | | | | | | | | | | | |
| Taiwan: Ch'uan-fan-shih | | | | 2 | | 2 | 14 | 13 | 7 | 1 | | | | | | | | | 17.56 |
| Philippines: Bantangas, Cebu, Negros | | | | | 6 | 4 | 2 | 1 | | | | | | | | | | | 15.85 |
| Neth. Indies: Ambon, Saparua | | | | 5 | 4 | 8 | 2 | | | | | | | | | | | | 15.37 |
| New Ireland (unspecified) | | | | | 1 | 1 | 3 | | | | | | | | | | | | 16.40 |
| Solomons: Guadalcanal | | | | | | | | 1 | 2 | | | | | | | | | | 18.67 |
| N. Australia: Kendrew I | | | | | 1 | | 1 | 1 | | | | | | | | | | | 16.67 |

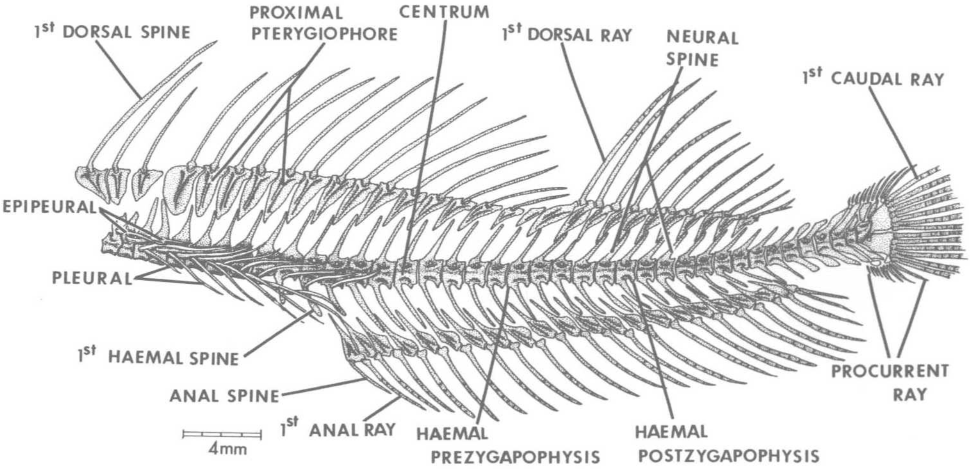


Figure 4. Axial skeleton of *Helcogramma fuscopinna* (lateral view).

recurved conical teeth in 3–4 irregular rows decreasing in size from outermost to innermost row; 2–3 irregular rows of conical teeth on vomer and anterior ends of palantines (Fig. 5). Septal bone present (Fig. 3A); dorsal process of anguloarticular bone not much elongate (Fig. 5); mandibular symphysis without a pronounced knob; hypural 5 reduced to cartilage (Fig. 6); two epurals (Fig. 6); ventral hypural plate autogenous.

SPECIES. *Helcogramma* comprises 12–13 species (depending upon the inclusion of *H. trigloides*): *billi* n. sp.; *capidata* Rosenblatt, 1960; *chica* Rosenblatt, 1960; *decurrens* McCulloch and Waite, 1918; *ellioti* (Herre, 1944); *fuscopinna* Holleman, 1982; *hudsoni* (Jordan and Seale, 1906); *obtusirostris* (Klunzinger, 1871); *rhinoceros* n. sp.; *springeri* n. sp.; *steinitzi* Clark, 1980; and *striata* n. sp.

*Distribution Patterns.*—All species in the genus *Helcogramma* are close-shore

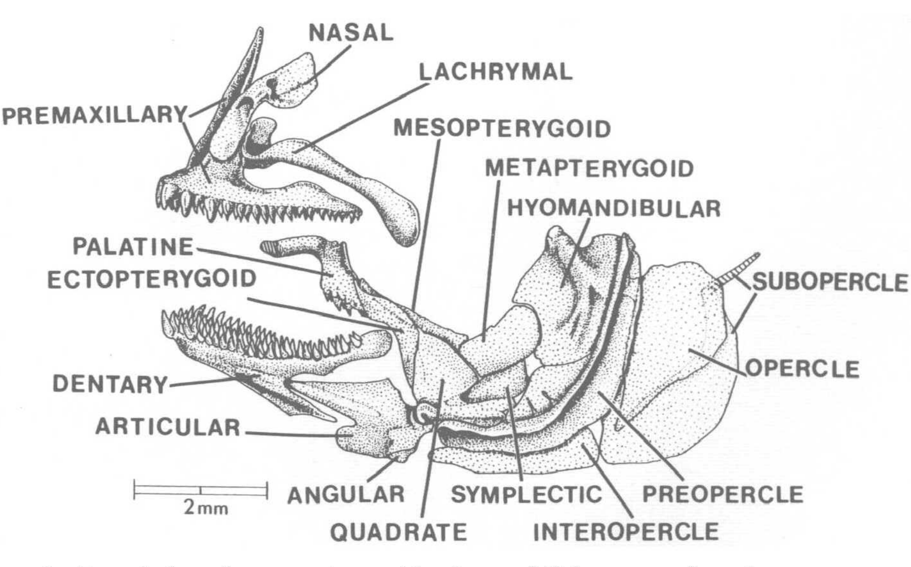


Figure 5. Lateral view of suspensorium and jaw bones of *Helcogramma fuscopinna*.

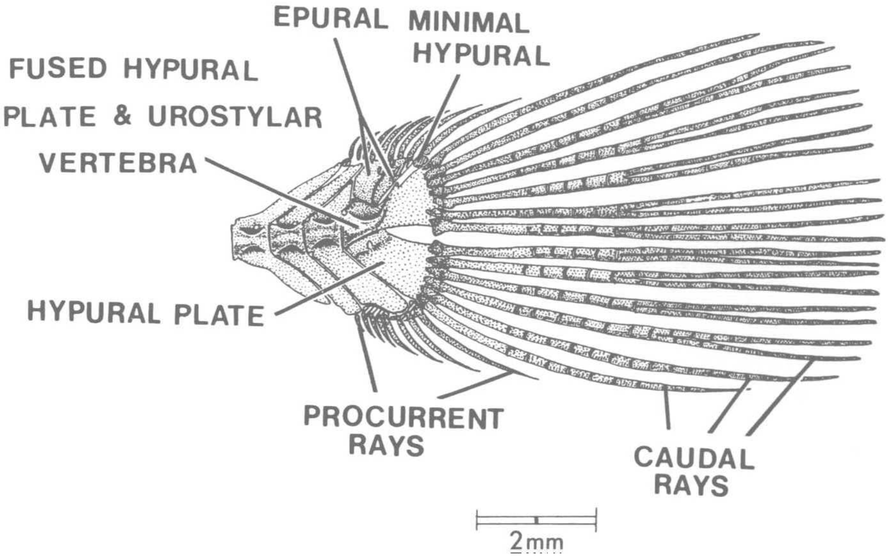


Figure 6. Caudal skeleton of *Helcogramma fuscopinna*.

inhabitants of the Indo Pacific (one species occurs in the Southeastern Atlantic as well). Although *H. billi, H. decurrens* and *H. steinitzi* have highly restricted distributions (Sri Lanka, Australia and the Red Sea, respectively), the other nine species of *Helcogramma* have distributions that include variously the Pacific, Philippine, Indian-Australian and African lithospheric plates. *Helcogramma capidata* is a widely distributed Pacific Plate endemic species (defined by Springer, 1982). *Helcogramma obtusirostris* occurs from the Southeastern Atlantic to the Red Sea and Indian Ocean to the western margin of the Pacific Plate, but is absent from the Plate. *Helcogramma fuscopinna* has a distribution similar to that of *H. obtusirostris* but does not occur in the Atlantic or Red Sea. *Helcogramma hudsoni* and *H. chica* are distributed from the eastern Indian Ocean to the Central Pacific Ocean. *Helcogramma ellioti* is distributed from the eastern Indian Ocean to the western margin of the Pacific Plate between latitudes 20°N and 20°S. *Helcogramma striata* has a distribution similar to that of *H. ellioti,* but does not extend as far south eastward. *Helcogramma springeri* is restricted to the islands on the western margin of the Pacific Plate between the 20°N and S latitudes and *H. rhinoceros* has a similar distribution but is found only between the 10°N and S latitudes.

*Color Pattern and Morphometrics.*—All species but *Helcogramma striata* are sexually dimorphic in color pattern. Female color pattern varies little between species; however, male color pattern varies considerably between species and is species specific. Females and juveniles have the most common color pattern for the genus: Light bodies with 4–6 dark H-shaped bands (diffuse in some), with scattered pigment on the head, pigment concentrated in an oblique line from the anteroventral corner of each eye, over nares to the upper lip.

Males and females often show differences in certain morphometric characters. Males may have longer first dorsal spines and anal-fin bases than females, and females have longer P1-anal distances than males. Although these differences were not always statistically significant, they can be noted as general characters of the genus.

## KEY TO THE SPECIES IN THE GENUS *HELCOGRAMMA*

Species of the genus *Helcogramma* are similar in morphometric and meristic characters (Table 3) and are easily confused. Males larger than 20.0 mm SL can be distinguished as to species by color pattern which is species specific. Females and smaller specimens are more difficult to distinguish because most (except for *H. decurrens*) have the generalized color pattern described above. Females and smaller specimens of *H. rhinoceros* are especially difficult to key because they overlap in all characters with *H. obtusirostris* females and smaller specimens. However, mean second dorsal-fin spine and soft anal-fin ray numbers are significantly different ($P < 0.05$) for *H. obtusirostris* and *H. rhinoceros* (even though ranges for these counts overlap), and this can often be used to distinguish between these two species. In addition, the distributions of these two species do not overlap (see Figs. 16 and 17).

1a. Males longer than 20.0 mm SL with flaplike extension on tip of upper lip (Fig. 7) (Philippines and Solomon Islands) ........ *rhinoceros*
1b. No flaplike extension on tip of upper lip in either sex ........ 2
2a. Orbital tentacle present (may be minute) ........ 7
2b. Orbital tentacle absent ........ 3
3a. Body with 3 dark (blue in life), longitudinal stripes running from snout to caudal peduncle, and a row of 6–7 dark (blue in life) spots just below lateral line on body; body without irregular dark H-shaped bars (Indian Ocean, Indonesia, and Western Pacific Islands) ........ *striata*
3b. Body without longitudinal stripes or row of spots; body with irregular, dark H-shaped bars, or body with little pigmentation ........ 4
4a. Lateral line with 12–14 pored scales; second and third dorsal fins with dark, oblique bars (Indonesia and Western Pacific Islands) ........ *springeri*
4b. Lateral line with 18–27 pored scales; second and third dorsal fins with or without dark, oblique bars ........ 5
5a. Second and third dorsal fins with dark oblique bars; mandibular pores series 4–5 + 3 + 4–5 (Fig. 2e) (Indian Ocean, North and N.E. Australia, Java Sea, and Western Pacific Islands) ........ *hudsoni*
5b. Second and third dorsal fins without dark oblique bars; mandibular pore series 3–10 + 1 + 3–10 ........ 6
6a. Upper jaw 9.8–12.1% SL, ending below anterior half of eye; mandibular pore series 3 or 4 + 1 + 3 or 4; lateral line with 18–23 pored scales; males greater than 20.0 mm SL with dark facial pigment that covers chin and ends abruptly between isthmus and pelvic-fin base (Indian Ocean, Indonesia, and Western Pacific islands) ........ *chica*
6b. Upper jaw 14.5–18.1% SL, ending below posterior half of eye; mandibular pore series 5–10 + 1 + 5–10; lateral line with 20–27 pored scales; males longer than 20.0 mm SL with dark facial pigment that fades gradually on chin, and ends well before isthmus (Pacific: Mariana, Caroline, Marshall, Gilbert and Phoenix islands) ........ *capidata*
7a. Mandibular pore series 6 or 7 + 1–2 + 6 or 7; males greater than 22.0 mm SL with a stripe of tiny chromatophores across upper lip and over opercle surrounded by larger, darker pigment spots (Fig. 8) (West Africa, Indian Ocean, Indonesia, and Western Pacific islands) ........ *fuscopinna*
7b. Mandibular pore series 3–5 + 1–3 + 3–5; no stripe of tiny chromatophores across upper lip and over opercle in either sex ........ 8
8a. Nape scaled ........ 13
8b. Nape naked ........ 9
9a. Mandibular pore series 4 or 5 + 3 + 4 or 5 (Fig. 1e) (Indian Ocean, North Australia, Java Sea, and Western Pacific islands) ........ *hudsoni*
9b. Mandibular pore series 3 or 4 + 1 + 3 or 4 ........ 10
10a. Lateral line with 25–37 pored scales; males greater than 20.0 mm SL with obvious dark area surrounding a transparent spot on and after third spine of first dorsal fin; dark oblique bars on second and third dorsal fins in both sexes (may not be obvious in females); upper jaw 14.0–17.2% SL, ending below posterior half of eye (Fig. 9) (Indian Ocean, Indonesia, Western Pacific islands) ........ *ellioti*
10b. Lateral line with 18–24 pored scales; first, second and third dorsal fins lightly pigmented, without distinct markings; upper jaw 11.6–15.0% SL, ending below anterior half of eye ........ 11
11a. Males greater than 22.0 mm SL with body distinctly divided by lateral line into light dorsal and dark ventral regions, females and juveniles with irregular dark bars, only below lateral line; body of both sexes witout H-shaped bars (Southwestern Australia) ........ *decurrens*
11b. Body not distinctly divided into light dorsal and dark ventral regions in either sex; body with irregular dark, H-shaped bars or body with light pigmentation (not Southwestern Australia) ........ 12

12a. With second dorsal-fin spines 12–15 (mean approx. 13.6); segmented anal-fin rays 18–20 (mean approx. 19.0) (Ascension Island, St. Helena Island, Red Sea, Indian Ocean, Indonesia, Western Pacific islands) ........ *obtusirostris*

12b. With second dorsal-fin spines 14–15 (mean approx. 14.4); soft anal-fin rays 19–21 (mean approx. 19.5) (Philippines and Solomon islands) ........ *rhinoceros*

13a. Lateral line with 27–33 pored scales; males greater than 18.0 mm SL with distinct clear areas surrounded by dark pigment in second dorsal fin (Fig. 10) (Indian Ocean, Sri Lanka) ........ *billi*

13b. Lateral line with 20–27 pored scales; second dorsal fin darker towards dorsal edge, without clear areas surrounded by dark pigment in either sex (Red Sea) ........ *steinitzi*

## ***Helcogramma billi*** new species
### Figure 10

*Comparison with Other Species.*—*Helcogramma billi* sympatric with four other *Helcogramma* species (*H. striata, H. obtusirostris, H. chica,* and *H. ellioti*) and easily distinguished from all by meristics. Number of lateral-line scale tubes significantly greater ($P < 0.01$ using Mann-Whitney *U*-test) in *H. billi* (range = 27–33) than in *H. chica* (range = 18–23), *H. obtusirostris* (range = 19–24) and *H. striata* (range = 14–20). *Helcogramma billi* readily distinguished from *H. ellioti* by presence of nape scales in *H. billi,* lacking in *H. ellioti.* Occipital canal in *H. billi* simple while *H. ellioti* has moderately complex occipital canal system (Fig. 1). Specimens of *H. billi* 20–32.0 mm SL with crenulations on inside of lips, which all specimens of *H. ellioti* lack.

*Description.*—Dorsal fin III, XIII–XIV (usually XIII), 9–11 (usually 10–11); anal fin I, 17–20 (usually 19–20); orbital tentacle simple; cephalic sensory pores simple (Fig. 1c); mandibular pore series 2–3 + 1 + 2–3 (Fig. 2c); lateral line pores 27–33 (usually 30); lateral line ending under 24th–28th dorsal-fin element; nape scaled.

*Color Pattern.*—Based on preserved specimens only. Male with dark facial pigment beginning below level of ventral border of eye, continuing onto chin, isthmus, and pelvic-fin base; pectoral-fin base darkly pigmented, pectoral-fin rays darker towards posterior edges; body with 5 dark H-shaped bars with small light areas in between, first bar just posterior to pectoral-fin base, last on caudal peduncle; first dorsal fin darkly pigmented towards dorsal edge; second dorsal fin dark black with 4 distinct clear areas basally on fin elements 2, 5, 9, and 11 and with clear stripe near dorsal margin; third dorsal fin dark with 2–3 light bands and light stripe near dorsal margin; anal fin uniformly dark, rays lighter; caudal fin with 2–3 dark vertical bands; pelvic-fin rays dark.

Female and juvenile with little or no pigment below eye level on head; often with diffuse, dark spots on opercle, chin, and pectoral-fin bases; pigment concentrated into dark band, below eye and to upper lip; body light with 5 dark H-shaped bars as in male; all fins light with irregular dark bars; large females with second and third dorsal fins pigmented as in males.

*Measurements* (N = 22; 17 males, 5 females).—Head length 30.3 (28.8–32.7); eye diameter 10.9 (9.6–11.8); second dorsal-fin base 33.5 (31.8–36.9); third dorsal-fin base 21.7 (19.7–23.3); anal-fin base 45.6 (41.8–50.0); distance P1-anal fin 23.5 (21.6–25.6); first dorsal-fin spine 13.2 (11.3–15.1); longest second dorsal-fin spine 13.3 (11.1–17.1); longest third dorsal-fin ray 12.8 (11.7–14.6); seventh pectoral-fin ray 29.7 (27.4–30.4); upper jaw length 14.0 (13.2–15.3).

*Remarks.*—Although *H. billi* has only been found in Sri Lanka, it probably occurs in other nearby areas of the Indian Ocean. Sri Lanka is not known as an area of marine endemism for fishes although there are two additional blennioid species apparently endemic to this island: *Omobranchus hikkaduwensis* Bath and *Antennablennius ceylonensis* Bath. *Helcogramma billi* is average-sized for the genus: Adults range from 20.0–32.0 mm SL.

*Material Examined.*—HOLOTYPE: USNM 222377 male (29.5) from Trincomalee Bay, Sri Lanka. PARATYPES: (N = 17); USNM 222380, 13 males (22.0–31.5), 14 females (20.0–27.4); same data as holotype. USNM 222367, 5 males (26.5–30.3); USNM 222367, 1 male (29.0) cleared and stained with alizarin red and alcian blue; USNM 222368, 1 male (28.9); USNM 222374, 3 males (21.0–31.3), all from Trincomalee Bay, Sri Lanka.

*Etymology.*—Named *billi* after William ("Bill") Smith-Vaniz, who collected all the specimens I have examined.

### *Helcogramma capidata* Rosenblatt, 1960

*Helcogramma capidata* Rosenblatt in Schultz, 1960: 297. PL 121, C (type locality Kapingamarangi Atoll, Caroline Islands).
*Enneapterygius hudsoni* (non Jordan and Seale) Schultz, 1943: 286 (in part).
*Helcogramma* sp. Randall, 1955: 216 (type locality Onotoa, Gilbert Is.).

*Comparison with Other Species.*—*Helcogramma capidata* sympatric with *H. chica, H. hudsoni,* and *H. rhinoceros. Helcogramma capidata* distinguished from *H. rhinoceros* by lack of extension on upper lip in males of *H. capidata* found in males of *H. rhinoceros. H. capidata* with significantly more ($P < 0.01$ using Mann-Whitney *U*-test) lateral-line scale tubes (range = 20–27) than *H. rhinoceros* (range = 18–21). *Helcogramma capidata* with significantly more ($P < 0.01$ using Mann-Whitney *U*-test) mandibular pores (range = 11–21) than *H. chica* (range = 5–7), also distinguished from *H. chica* by pigment pattern on ventral region of head: dark pigment ends abruptly posterior to isthmus in *H. chica* and fades gradually anterior to isthmus in *H. capidata. Helcogramma capidata* distinguished from *H. hudsoni* by mandibular pore series: *H. hudsoni* has 3 central mandibular pores, and *H. capidata* has 1 central pore.

*Description.*—Dorsal fin III, XIII–XV (usually XIV); 10–12 (usually 11); anal fin I, 19–21 (usually 20–21); orbital tentacle absent; cephalic sensory pores simple (Fig. 1f); mandibular pores series 5–10 + 1 + 5–10 (Fig. 2f); lateral-line pores 20–27 (mean varying with locality, Table 2a); lateral line ending under 14th–20th dorsal-fin element; nape naked.

*Color Pattern.*—Based on preserved specimens only. Male pale with few melanophores on body; melanophores mostly below lateral line on anterior ½ of body; specimens >30 mm SL with 4–5 faint bars on body; head, chin, opercle and lower ½–⅔ pectoral-fin base dark; elongate triangle of dark pigment on central pectoral-fin rays; chin and isthmus dark, pigment fading gradually before posterior edge of isthmus; interorbital and top of head pink-orange with few scattered melanophores; pelvic-fin rays dark towards base; dorsal-fin margin dark; anal fin dusky, margin dark; caudal fin dusky.

Female and juvenile much lighter than male; body light; head with few scattered melanophores on opercle and lip; top of head pink; pelvic and pectoral fins and bases with few scattered melanophores; unpaired fins clear or with faint dusky bars.

*Measurements* (N = 10; 5 males, 5 females).—Head length 32.2 (31.2–33.3); eye diameter 10.5 (9.4–12.5); second dorsal-fin base 31.7 (28.8–33.8); third dorsal-fin base 20.3 (18.7–22.6); anal-fin base 42.9 (41.4–45.8); first dorsal-fin spine 12.4 (10.4–17.0); longest second dorsal-fin spine 15.7 (13.7–17.0); longest third dorsal-fin ray 15.7 (14.1–16.4); distance P1-anal fin 23.7 (21.2–26.3); seventh pectoral-fin ray 28.7 (26.8–31.6); upper jaw length 15.8 (14.2–17.7); longest pelvic-fin ray 23.4 (21.1–24.6).

*Remarks.*—This is a medium-sized species of *Helcogramma*, adults ranging from 22.0–37.0 mm SL. It is a widely distributed Pacific Plate endemic species (Springer, 1982). It does not appear to have significant geographic variation in color pattern or dorsal- and anal-fin counts; however, specimens from the Gilbert and Phoenix Islands have higher mean lateral-line scale counts ($\bar{x} = 24.3$–$25.2$) than specimens from other locations ($\bar{x} = 21.3$–$23.4$).

*Material Examined* (N = 97).—Marianas Ids; Guam: UG 4154, 1 female (29.5); UG 4601, 2 males (30.2, 32.1); UG 5856, 1 female (24.0); BPBM 17770, 2 males (28.5, 32.0); Maug: UG 5995, 1 male (31.0), 1 female (33.5). Caroline Is.; Ponape: USNM 223219, N = 11 (19.2–25.2); USNM 223187, N = 4 (15.0–27.0); USNM 223119, N = 33 (14.6–27.3); USNM 223282, N = 7 (15.4–28.5); USNM 224338, 1 male (26.5); USNM 223263, 1 male (25.1); USNM 223318, N = 1 (14.3–28.5). Marshall Is.; Enewetak Atoll: BPBM 18422, 2 females (26.0, 29.0); Bikini Atoll: USNM 142251, 1 juvenile (14.5); Rongelap and Rongerik Atolls: USNM 142250 (paratypes), 1 male (25.5); 1 female (22.2); USNM 142249 (paratypes), 1 male (27.3); Taka Atoll: USNM 222312, 1 male (29.0). Gilbert Is.; Onotoa Atoll: USNM 222307, 3 males (29.0–32.0); 1 male (31.8) cleared and stained with alcian blue and alizarin red. Phoenix Ids; Hull I.: USNM 115516 (paratype), 1 female (33.1); USNM 175255 (paratypes), 1 male (29.0), 1 female (32.1). Fiji: USNM 236391, 3 males (27.0–28.0); USNM 236392, 1 female (30.5); USNM 236393, 1 female (26.0); USNM 236395, 6 males (28.0–32.0), 4 females (27.0–30.0); USNM 236547, 2 males (30.0, 32.0).

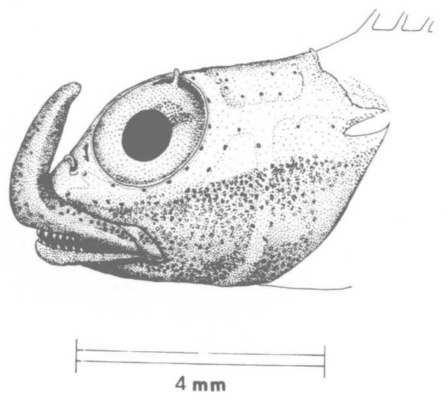
## *Helcogramma chica* Rosenblatt, 1960

*Helcogramma chica* Rosenblatt, 1960: 295, fig. 114 (type locality Hull Island, Phoenix Is.).
*Enneapterygius hudsoni* (non Jordan and Seale) Schultz, 1943 (in part).

*Comparison with Other Species.*—*Helcogramma chica* sympatric with all *Helcogramma* except *H. decurrens* and *H. steinitzi*. *Helcogramma chica* with mean SL = 22.06 ± 5.3 SD is significantly smaller ($P < 0.05$) than each other *Helcogramma* species using pairwise comparison of standard errors of differences between means. *Helcogramma chica* distinguished from *H. capidata* by mandibular pore series: 3–4 + 1 + 3–4 in *H. chica* and 5–10 + 1 + 5–10 in *H. capidata*. *H. chica* distinguished from *H. billi, H. ellioti, H. fuscopinna, H. obtusirostris* and *H. rhinoceros*: *H. chica* without orbital tentacle which other five species possess. *H. chica* distinguished from *H. hudsoni*: *H. hudsoni* with 3 central mandibular pores, *H. chica* with 1 central mandibular pore. Number of lateral-line scale tubes significantly greater ($P < 0.001$ using Mann-Whitney *U*-test) in *H. chica* (range = 18–23) than in *H. springeri* (range = 11–14). *Helcogramma chica* lacks nape scales, which *H. striata* possesses.

*Description.*—Dorsal fin III, XIII–XIV (usually XIV–XV), 9–12 (usually 9–10); anal fin I, 18–20 (mean varying with locality, Table 1a); orbital tentacle absent; cephalic sensory pores moderately complex (Fig. 1i); mandibular pore series 3–4 + 1 + 3–4 (Fig. 2i); lateral-line pored scales 18–23 (mean varying with locality, Table 2a); lateral line ending under 16th–19th dorsal-fin elements; nape naked.

*Color Pattern.*—Based on preserved specimens only. Male with black facial pigment starting below level of ventral border of eye; dark chin, dark lower ⅔ opercles and isthmus; black pigment ends abruptly between isthmus and pelvic-fin base; pelvic fin without pigment; pectoral-fin base, dark, pectoral rays 5–11 (counting from ventral edge) with an elongate triangle of black pigment, tip of triangle extending to ⅓ length of central rays; body immaculate or with scattered melanophores, producing faint banded pattern; first dorsal fin dark in large specimens



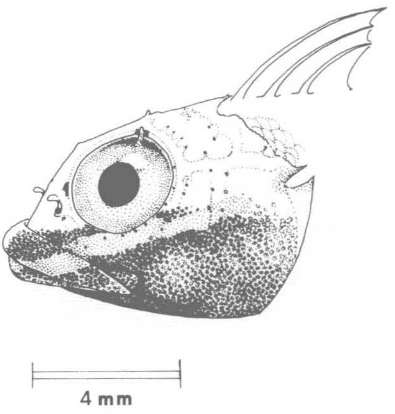


Figure 7. (Left) *Helcogramma rhinoceros*; lateral view of head showing the flaplike extension on tip of upper lip.

Figure 8. (Right) *Helcogramma fuscopinna*; lateral view of head showing the stripe of micromelanophores over the upper lip and opercle, surrounded by macromelanophores.

(>25 mm SL), light in smaller specimens; second and third dorsal fins with scattered melanophores; caudal fin with scattered melanophores; anal fin immaculate or with 4–5 dark bands.

Preserved female and juvenile with much less pigment than male; head with diffuse dark band from ventro-anterior edge of eye onto upper lip; remainder of face with scattered pigment spots; juvenile male (>17.0 mm SL) with same facial pigment as adult males, but melanophores more dispersed; bodies of preserved female and juvenile pigmented same as male except females with less dark first dorsal fins.

*Measurements* (N = 30; 19 males, 11 females).—Head length 28.3 (26.5–31.0); eye diameter 9.8 (8.1–12.0); second dorsal-fin base 36.1 (30.0—39.8); third dorsal-fin base 19.5 (16.5–24.3); anal-fin base 45.2 (42.6–50.0); distance P1-anal fin 25.3 (20.7–28.9); first dorsal-fin spine 11.9 (10.4–15.3); longest third dorsal-fin ray 11.6 (9.7–14.5); seventh pectoral-fin ray 31.0 (29.7–33.2); upper jaw length 11.8 (9.3–13.3).

*Geographic Variation.*—Large specimens of these species have darker pigmentation than smaller specimens; therefore those from Japan and Taiwan, which are

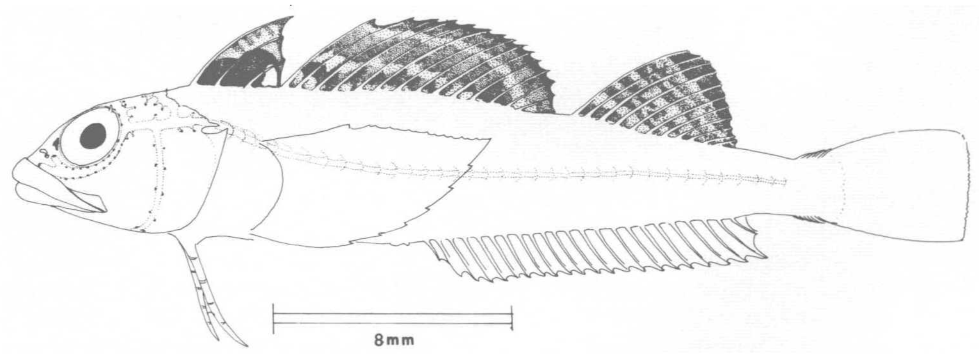


Figure 9. *Helcogramma ellioti*; lateral view of the whole fish with only the dorsal-fin pigmentation indicated.

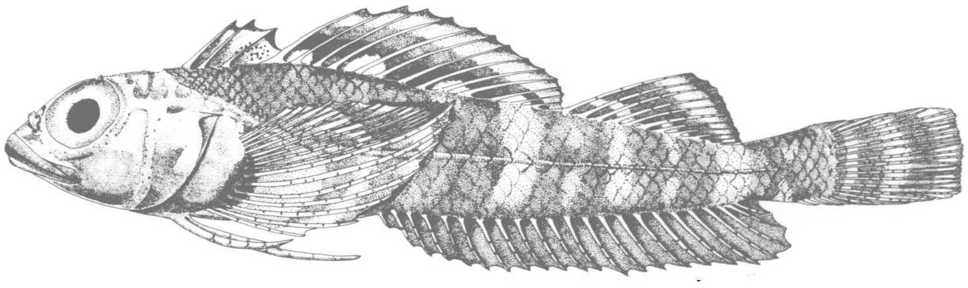


Figure 10. *Helcogramma billi*; male, 31.0 mm SL, paratype, USNM 222368.

in general larger, are also darker. The largest specimens from all localities show this trend.

Specimens from Guam, Phoenix Ids, and Samoa have more second dorsal spines ($\bar{x}$ = 14.60–15.33) than specimens from other localities ($\bar{x}$ = 13.00–14.33). Specimens from the Phoenix Ids. and Samoa also have more anal-rays ($\bar{x}$ = 19.40–20.00) than specimens from other localities ($\bar{x}$ = 18.00–19.33).

*Remarks.*—This is a widely distributed species in the Indo-West Pacific. It is small for the genus; 90% of the adults studied ranged from 17.0–25.0 mm SL. Stomach contents were examined in several specimens from various localities. Small crustaceans made up about 50% of the volume of the contents, and eggs (fish and others) made up the other 50%.

*Material Examined* (N = 145).—Indian O.; Sri Lanka: USNM 222310, 1 male (22.0); USNM 228976, N = 9 (17.0–23.0). Pacific: Izu Islands (Japan): USNM 222304, 3 males (32.0–33.7); Taiwan: USNM 222348, 1 male (22.0); USNM 222348, 1 male (26.1); USNM 222338, 1 male (27.2); USNM 228970, 1 male (29.5); Philippines: USNM 222376, N = 53 of which 6 males (14.0–25.5) and 6 females (16.6–22.0) were examined and one (20.0) removed for clearing and staining; USNM 222303, 1 male (27.6); USNM 227804, N = 9 (20.6–24.0); USNM 227807, N = 29 (22.0–27.1); Guam: BPBM 17770, 2 males (20.0, 21.0); UG 6050, 1 male (20.9); UG 4291, 1 male (18.0), 1 female (20.0); Bikini Atoll: USNM 142252 (paratype of *H. chica*), 1 female (21.2); Kapingamarangi Atoll: SNHM 52016 (paratype of *H. chica*), N = 10 (16.6–21.0); Phoenix Is.: USNM 115514 (paratypes of *H. chica*), 1 male (19.8), 1 female (19.2); USNM 115515 (paratypes of *H. chica*), N = 5 (13.5–18.5); USNM 222309, 2 males (18.5, 20.2); USNM 222308, 1 male (20.2); Samoa: USNM 115513, 1 male (14.4); USNM 115517, 1 male (11.0); USNM 222305, 4 males (14.5–22.6), 4 females (11.8–23.5).

### *Helcogramma decurrens* McCulloch and Waite, 1918

*Helcogramma decurrens* McCulloch and Waite, 1918: 52 plates, iii, fig. 2 (type locality St. Vincent Gulf, South Australia).

*Comparison with Other Species.*—*Helcogramma decurrens* occurs in Southwestern Australia and is allopatric with all other species of *Helcogramma*. *Helcogramma decurrens* distinguished by distinctive color pattern: light dorsal and dark ventral regions demarcated clearly in most preserved specimens. *H. decurrens* with uniquely arboreal appearance of occipital canal system (see Fig. 1g).

*Description.*—Dorsal fin III, XII–XIV (usually XII–XIV), 10–12 (usually 10–11); anal fin I, 17–21 (usually 20); orbital tentacle simple; cephalic sensory pores complex (Fig. 1g); mandibular pore series 4–5 + 1 + 4–5 (Fig. 2g); lateral-line pores 18–22 (usually 19–20, Table 2a);; lateral line ending under 13th–17th dorsal-fin elements; nape naked.

*Color Pattern.*—Based on preserved specimens only. Male with dark head below level of ventral border of eye; lower ⅔ of opercle, lips, chin dark, pigment ending

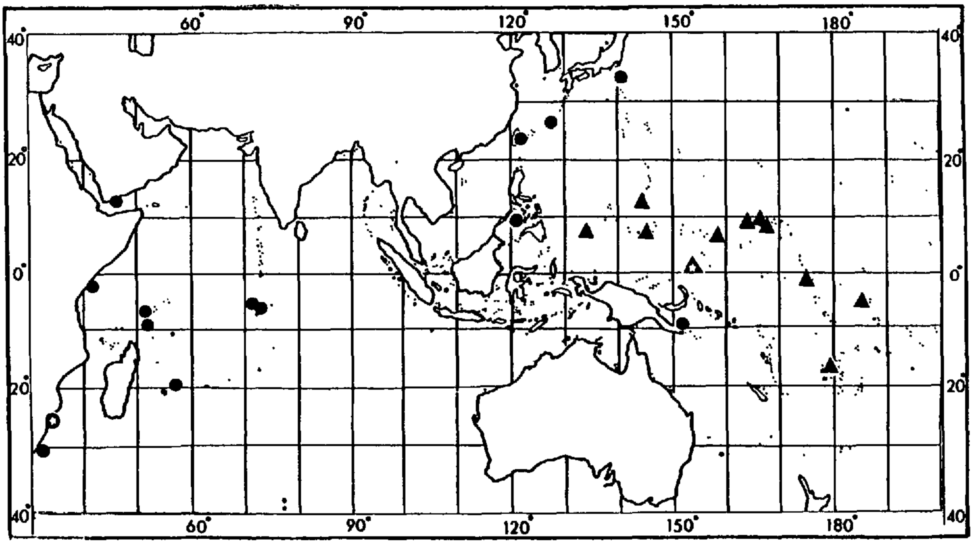


Figure 11. Distribution map of *Helcogramma capidata* (triangles), and *H. fuscopinna* (circles). White stars indicate type localities.

abruptly midway between chin and posterior edge of isthmus; pectoral-fin base dark, lower 8–9 pectoral rays dark; pelvic-fin base light, pelvic rays dark; belly without pigment to just posterior to urogenital papilla; urogenital papilla dark; body distinctly divided by lateral line into light dorsal and dark ventral regions; scales on light dorsal region bordered with black dots; dorsal fins and caudal fin with dusky bands; anal fin uniformly dark with black margin.

Female and juvenile with irregular dark pigment spots on lower ⅔ of opercle,

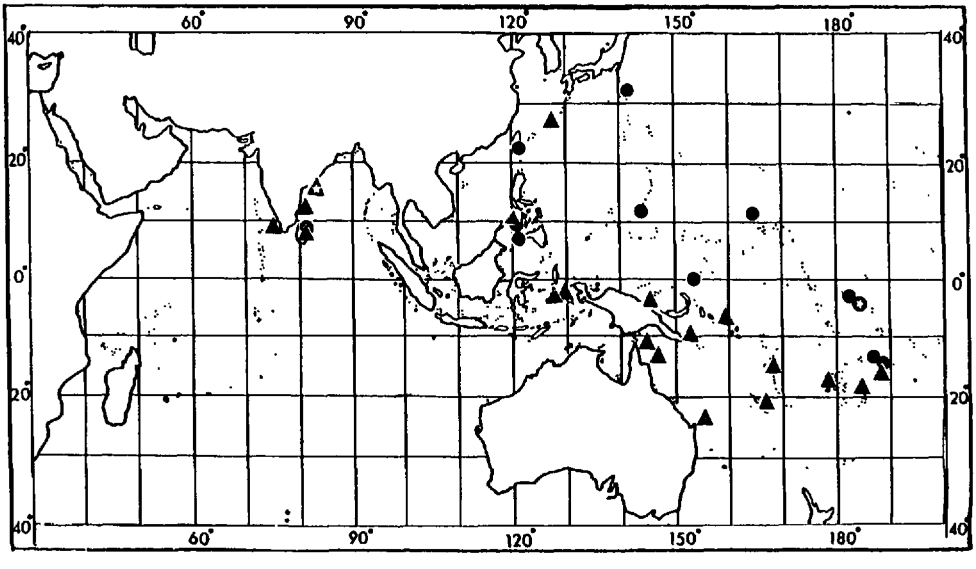


Figure 12. Distribution map of *Helcogramma chica* (circles) and *H. ellioti* (triangles). White stars indicate type localities.

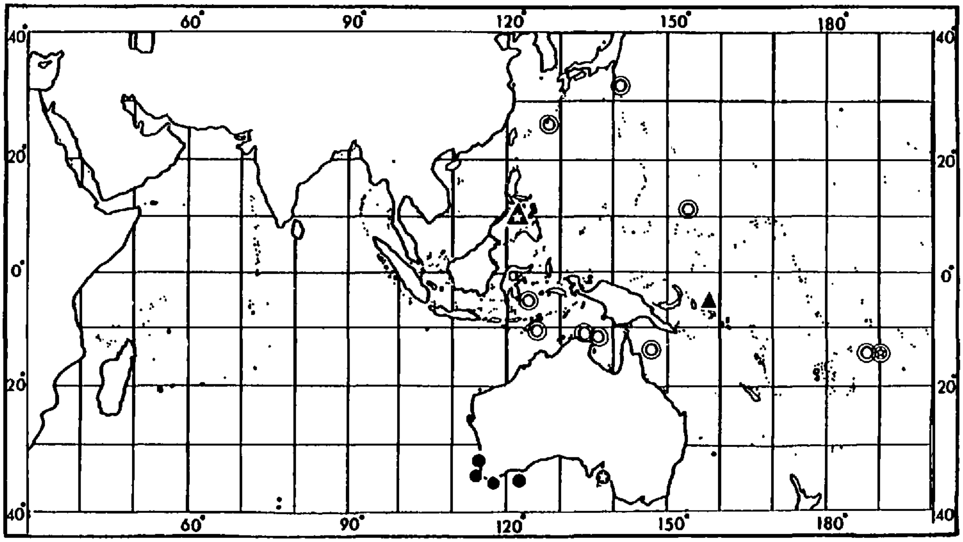


Figure 13. Distribution map of *Helcogramma decurrens* (solid circles), *H. hudsoni* (open circles) and *H. rhinoceros* (triangles). White stars indicate type localities.

and on lips and chin; tip of upper lip and interorbital area with irregular dark patches; pectoral base with 2–3 dark blotches; pectoral fin with dark bands; pelvic fin light; belly without pigment; unpaired fins with irregular bands of dark spots; body with 4–5 irregular bands below lateral line only.

*Measurements* (N = 20; 10 males, 10 females).—Head length 28.7 (27.2–30.1); eye diameter 9.6 (8.7–11.2); second dorsal-fin base 33.3 (31.0–36.5); third dorsal-fin base 22.4 (20.0–24.8); anal-fin base 45.5 (42.6–48.1); distance P1-anal fin 24.6 (21.6–27.0); first dorsal-fin spine 11.8 (8.2–14.7); longest second dorsal-fin spine 15.1 (12.5–17.0); longest third dorsal-fin ray 14.0 (10.9–15.2); seventh pectoral-fin ray 28.8 (26.3–31.3); upper jaw length 13.1 (10.9–14.5); longest pelvic-fin ray 24.2 (21.9–28.0).

*Remarks.*—This is a medium-sized species of *Helcogramma,* adults ranging from 22.0–45.0 mm SL. It is restricted to South Australia and seems to be the only species of *Helcogramma* to occur there. Although the distinctive color pattern was not fully described by McCulloch and Waite (1918), it is obvious in fishes preserved for as long as 10 years. This species does not show significant geographic variation in meristics, color pattern, or measurements.

*Material Examined* (N = 40).—Southwestern Australia: F 498 (holotype of *H. decurrens*), male (41.5) from Gulf of St. Vincent; AMNH 38220, 18 males (29.5–40.0), 18 females (16.0–38.0) from Cape Freycinet; AMNH 31327, 1 female (24.9) from North Point; USNM 222313, 1 male (35.8), 1 female (36.0) from Pt. Peron; AMSI 20222-017, N = 3 (20.0–23.0), Mondrain Is.

## *Helcogramma elliot*i (Herre, 1944)
### See Figure 9 in Key

*Tripterygium trigloides* (non Bleeker) Day, 1888: 336 (type locality Madras Coast, India).
*Tripterygion ellioti* Herre, 1944: 49 (type locality Vizagapatam, India); Lal Mohan, 1968: 124, fig. 6 (Gujarat,India).
*Helcogramma indicus* Talwar and Sen, 1971: 249 (type locality Tamil Nadu, South India).

*Comparison with Other Species.*—*Helcogramma elliotí* sympatric with all *Helcogramma* except *H. capidata, H. steinitzi* and *H. decurrens. Helcogramma ellioti* with significantly more ($P < 0.05$ using Mann-Whitney $U$-test) lateral-line scale tubes than every *Helcogramma* species it is sympatric with excluding *H. billi* and *H. fuscopinna.* Range of lateral-line scale tubes = 22–37 in *H. ellioti,* 18–23 in *H. chica,* 20–26 in *H. hudsoni,* 19–24 in *H. obtusirostris,* 18–21 in *H. rhinoceros,* 11–14 in *H. springeri,* and 14–20 in *H. striata. Helcogramma billi* with nape scales, *H. ellioti* without nape scales. *Helcogramma fuscopinna* with 5–7 + 1–2 + 5–7 in mandibular pores series, *H. ellioti* with 3 + 1 + 1 in mandibular pore series.

*Description.*—Dorsal fin III, XII–XV (usually XIII–XIV); 9–12 (usually 10–11); anal fin I, 17–22 (mean varying with locality, Table 1a); orbital tentacle simple; cephalic sensory pores moderately complex (Fig. 1d); mandibular pore series 3 + 1 + 3 (Fig. 2d); lateral-line pores 22–37 (mean varying with locality, Table 2a); lateral line ending under posteriormost 8 dorsal-fin elements or on caudal peduncle; nape naked.

*Color Pattern.*—Live, based on Herre (1944). Male with red-orange body, scales outlined in dark spots; pectoral base with a brilliant blue ocellus surrounded by red, orange or gold; underside of head up to eye brilliant blue or dotted with dark blue; eye and interorbitals golden or orange, abdomen and pelvic-fin golden-red; anal fin brilliant blue; second and third dorsal fin red with a blue band basally and along dorsal margin; first dorsal fn blue anteriorly, remainder red or gold; caudal fin blue.

Live female and juvenile much paler; large female with dull ocellus or small spots on pectoral base; body pale golden or red with 4–5 dark H-shaped bands, anteriormost band just posterior to pectoral-fin base, posteriormost on caudal peduncle; head spotted with red; pectoral fin with 3–5 rows of red spots; caudal fin with 2–3 rows of red spots.

Preserved male with pale body with 4–5 dark H-shaped bars, anteriormost just posterior to pectoral fin base, posteriormost on caudal peduncle; head dark below level of ventral border of eye; chin, isthmus, and pelvic-fin base dark; abdomen with scattered pigment spots, may be concentrated around urogenital papilla; pectoral-fin bases dark; ventral pectoral rays 8–10 dark, remainder light; first dorsal fin with dark spot on spines 1 and 2, and with distinct clear area on and posterior to spine 3; second and third dorsal fin with dark oblique bars; caudal and anal fin uniformly dusky.

Preserved female and juvenile much lighter; body with 4–5 dark H-shaped bars as in male; head with scattered, irregular brown spots, concentrated in a patch above upper lip and below eye; lower jaw with an indistinct dark patch just ventral to posterior edge of mouth; all fins with vague dark oblique bars; abdomen without pigment.

*Measurements* (N = 25; 13 males, 12 females).—Head length 31.2 (28.0–33.0); eye diameter 9.4 (8.1–10.6); seventh pectoral ray 29.4 (28.0–31.7); upper jaw length 15.3 (13.0–17.2); longest pelvic-fin ray 22.2 (16.0–27.9).

*Geographic Variations.*—Specimens from the New Hebrides, Ambon in the Moluccas, and the Philippines have fewer lateral-line scales ($\bar{x} < 30.0$) than all other specimens ($\bar{x} \geq 31.4$). This variation seems to be clinal, with the shortest lateral lines occuring in the center of the range. Specimens from India have fewer segmented dorsal rays ($\bar{x}$ = 9.0–9.5) than do specimens from other localities ($\bar{x}$ =

10.6–11.1). Specimens from India also have fewer segmented anal rays ($\bar{x}$ = 18.0–18.1) than specimens from other localities ($\bar{x}$ = 20.0–21.0). These meristics also seem to form a cline, although no specimens from intermediate localities are available.

Specimens from the Philippines have shorter pelvic-fin rays ($\bar{x} < 17.2\%$ SL) than specimens from other localities ($\bar{x} > 19.8\%$ SL). Indian specimens have shorter upper jaw lengths ($\bar{x} < 13.8\%$ SL) than specimens from other areas ($\bar{x} >$ 14.5% SL).

*Remarks.*—This species is widely distributed in the Indo Pacific, and shows a wide range of counts and measurements. It is relatively large, adults being 25.0–57.0 mm SL. The color pattern of *elliott* is consistent over its large range, which causes me to doubt that it should be subdivided; however a closer look at populations in the Philippines and India may merit nomenclatural recognition.

*Synonymy.*—Day (1888) first reported this species from Waltair, India as *Tripterygium*[2] *trigloides* Bleeker, but he had seen only the colored illustrations of Sir Walter Elliot, which he described in detail; Herre (1944) found that Day's description matched fishes he was describing from Vizagapatam, India. Herre (1944) named the new fish *Tripterygium elliott* after Sir Walter Elliot. Later Lal Mohan (1968) placed this species in *Helcogramma* because of its single continuous lateral line.

*Helcogramma indicus* Talwar and Sen 1971 was described from a female holotype and three female paratypes. Talwar and Sen (1971) mentioned that their species "agrees well" with Day's (1888) description of *T. trigloides*, but they were apparently unaware of Herre's (1944) description of *elliott.*

*Material Examined* (N = 179).—Indian O.; India, Vizagapatam: SU 38840 (holotype of *Helcogramma elliott*), male (33.0); SU 38841 (allotype of *H. elliott*), female (36.8); USNM 123656 (paratypes of *H. elliott*), 2 males (28.0, 31.5); 2 females (29.4, 30.6); ANSP 145943, 3 males (29.3–36.2); ANSP 145942, 1 female (27.2); Sri Lanka; Trincomalee: USNM 222953, 1 female (34.9); Okha and Madras: F6074/2 (holotype of *H. indicus*), female (38.4); F6075/2 (paratypes of *H. indicus*), 3 females (25.0–35.0). W. Pacific O.; Philippines: USNM 222949, 12 males (38.5–42.1), 5 females (38.2–40.0); USNM 222947, 1 male (38.2), 9 females (38.2–42.2); USNM 222948, 1 male (40.2), 1 female (37.7); USNM 222946, 2 males (38.4, 43.0), 2 females (29.2, 41.9); USNM 222952, 2 males (37.5, 42.9); USNM 222951, 1 female (35.0); USNM 222950, 2 females (38.4, 39.5); Japan: USNM 229352, 1 male (43.4); USNM 230384, 2 females (42.5, 41.0). Indonesia; Moluccas: USNM 164590, 3 males (26.5–39.0); USNM 221940, 1 male (39.7); USNM 229353, N = 12 (19.2–31.3); Papua, New Guinea: USNM 222925, 7 females (30.6–44.0); USNM 228985, 11 males (37.0–45.0), 2 females (37.5, 37.7); Muschu I: USNM 222929, 1 male (37.5), 1 female (33.4); Solomon Ids: USNM 195786, 2 males (22.5, 28.6), 2 females (27.4, 29.6); BPBM 16118, 1 male (43.4), 1 female (37.0); New Caledonia and New Hebrides: USNM 198966, 1 male (30.7); USNM 222926, 1 male (38.0), 1 female (34.0); S. Central Pacific O.; Tonga: USNM 222955, 1 female (32.4); USNM 222927, 3 males (38.4–39.0); Fiji: USNM 222954, 2 males (40.4, 41.0); USNM 236397, N = 31 of which 9 males (33.0–42.0), 8 females (26.0–34.0) were examined; Samoa: USNM 220061, N = 10 of which 3 males (35.0–40.6), 3 females (27.2–38.4) were examined; Coral Sea, Australia: USNM 222930, N = 19 of which 3 males (50.0–54.3) were examined; USNM 222928, 2 males (53.0), 4 females (47.7–52.8); USNM 263392, 1 male (41.0) cleared and stained. Australia (Queensland): AMS I. 20757-033, N = 7 (20.0–33.0), Raine Is.; AMS I. 19473-180, N = 16 (15.0–34.0); AMS I. 19483-072, N = 14 (20.0–31.0).

## *Helcogramma fuscopinna* Holleman, 1982

*Helcogramma fuscopinna* Holleman, 1982: 115, fig. 4 (type locality Zululand, South Africa).

*Comparison with Other Species.*—*Helcogramma fuscopinna* sympatric with all *Helcogramma* except *H. billi, H. capidata, H. decurrens* and *H. steinitzi. Helco-*

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[2] *Tripterygium* = *Helcogramma trigloides* will be discussed in detail under Species Inquirendum.

*gramma fuscopinna* with significantly more ($P < 0.05$) lateral-line scale tubes than *H. chica, H. rhinoceros, H. springeri* and *H. striata* (ranges = 20–33 for *H. fuscopinna,* 18–23 for *H. chica,* 18–21 for *H. rhinoceros,* 11–14 for *H. springeri* and 14–20 for *H. striata,* all comparisons using Mann-Whitney *U*-test). *Helcogramma fuscopinna* with significantly more mandibular pores ($P < 0.01$ using Mann-Whitney *U*-test) (range = 11–16) than *H. ellioti* (range = 5) and *H. obtusirostris* (range = 9–11). *Helcogramma fuscopinna* with 1–2 central mandibular pores, *H. hudsoni* with 3.

*Description.*—Dorsal fin III, XII–XVI (usually XIV or XV), 10–12 (usually 11); anal fin I, 19–22 (usually 20–21); orbital tentacle simple; cephalic sensory pores complex (Fig. 1j); mandibular pore series 5–7 + 1–2 + 5–7 (Fig. 2j); lateral-line pores 20–23 (mean varying with locality, Table 2a); lateral line ending under posteriormost 10 dorsal-fin elements; nape partially scaled or naked.

*Color Pattern.*—Live; based on Japanese and South African specimens. Male with light red-orange body with 4–5 bright white bands, first band below first dorsal fin, second and third below second dorsal fin, fourth and fifth below third dorsal fin and on caudal peduncle; irregular dark red-orange spots along lateral line; head with blue-black pigment on lower ⅔ of opercle; face, chin and lips dark blue below ventral border of eye; face with a light blue stripe from upper lip, below eye to middle of opercle; eye with red-orange iris, rimmed with light spots; first dorsal fin mostly red, tipped with dusky grey; second and third dorsal fin red basally, with dusky grey margin; caudal fin red with dusky margin; anal-fin and abdomen dusky; pectoral fin base with 2–3 light blue spots; lower 8–9 pectoral rays dark with a bright white spot basally on upper 7–8 rays. Male in spawning coloration with deep red body; jet black second and third dorsal-fin margin; jet black lower pectoral fin, caudal margin, anal fin and lower head; bright neon blue stripe across face; neon blue spots on pectoral base.

Live female and juvenile with grey-green body with 4–5 light bands as in male; unpaired fins dusky-clear; pectoral fin with dark base, light spot on upper 7–8 rays as in male; head with irregular red-brown spots on opercle and lips; dark oblong blotch on anterior tip of upper lip and below eye; eye yellow-green, mottled. Similarly colored throughout the year.

Preserved male with darkly pigmented lower head, lips, chin and isthmus; dark pigmentation on pelvic base and rays, and lower 8–9 pectoral rays; face with stripe of tiny, punctate chromatophores across upper lip, under eye to mid-opercle; 2–3 spots of tiny punctate chromatophores on pectoral base, surrounded by dark pigment; body, light yellow with 4–5 irregular, dark H-shaped bars, anteriormost bar just posterior to pelvic fin base, posteriormost on caudal peduncle; belly with scattered chromatophores; unpaired fins with uniform, dark pigmentation, concentrated at margins.

Preserved female and juvenile generally lighter, body yellow with 4–5 dark H-shaped bars as in male; posteriormost bar on caudal peduncle, often with an obvious 8-shape, leaving 2 round immaculate spots, one above the other; head with irregular spots of pigment on opercle and face, indistinct dark bar from upper lip, over nares to eye; chin with small, irregular spots; unpaired fins with several dark oblique bars; pectoral-fin base with crescent of pigment; 8–10 lowermost pectoral rays with dark pigment near base; pelvic fins and belly light.

*Measurements* (N = 20; 12 males, 8 females).—Head length 31.3 (28.8–33.3); eye diameter 11.0 (10.0–12.5); second dorsal-fin base 34.4 (30.9–36.5); third dorsal-fin base 19.6 (16.8–21.8); anal-fin base 45.0 (43.0–47.8); distance P1-anal fin 24.1

(22.1–27.7); first dorsal-fin spine 14.8 (12.8–17.1); longest second dorsal-fin spine 14.7 (12.6–16.9); longest third dorsal-fin segmented ray 14.3 (12.4–15.3); seventh pectoral-fin ray length 29.2 (27.3–31.2); upper jaw length 14.8 (13.3–16.4); longest pelvic-fin ray 24.0 (21.4–27.0).

*Geographic Variations.*—Most variation is seen in male specimens. Males from Japan, Taiwan and the Philippines are much darker than most others. Specimens from the western and central Indian Ocean are extremely light in coloration. Males from E. Africa and Papua New Guinea are intermediate in pigmentation. These variations were not correlated with seasonal changes.

Males from Izu Islands, Japan were as large as 50.0 mm SL, whereas at other localities, the largest were 43.0 mm SL. Specimens of both sexes from the Philippines have partially scaled napes and 2 central pores in the mandibular series. In other localities, all specimens had naked napes and one central pore in the mandibular series. Some males from the Philippines have 1 to 2% SL longer spines in the 1st dorsal fin than in other localities. Specimens from Miyake-jima, Izu Islands, Danjo Islands, and Taiwan have mean lateral-line counts of 26.67–29.43 whereas in all other localities, mean lateral-line counts were 21.93–24.00. In addition, specimens from the Danjo Islands and Taiwan have longer mean second dorsal-fin counts ($\bar{x}$ = 15.00–15.07) than specimens from other localities ($\bar{x}$ = 13.00–14.17). It is possible that further study will indicate that some of the populations merit nomenclatural recognition.

*Remarks.*—*Helcogramma fuscopinna* is a large species for the genus, adults being 25.0–50.0 mm SL. It is widely distributed in the Indo-Pacific and shows a great deal of geographic variation over its range.

*Material Examined* (N = 317).—Indian O.; East Africa: USNM 261390, 2 males (34.6, 35.8), Malindi, Kenya; USNM 218482, 1 male (40.5), 1 female (34.9). Yemen: Sta. USNM 222336, 1 male (31.2); USNM 222357, 1 female (27.5). Comoro Islands: USNM 229354, 3 males (33.4–34.3). Seychelle Islands: USNM 263390, N = 15 of which 5 males (30.0–37.2), 2 females (31.1, 33.6) were examined; USNM 222373, N = 6 (18.0–30.2); USNM 228946, 3 females (30.3–31.1). Mauritius: USNM 261391, 2 females (35.0, 37.0). Chagos. Islands: Sta. USNM 229355, 1 male (25.4), USNM 228951, 1 juvenile (15.5), 1 female (25.1). Pacific; Japan: USNM 222332, N = 2 (43.0–50.0); USNM 222346, 1 male (38.5); USNM 222324, N = 9 of which 3 males (48.1–49.1) were examined (two have been cleared and stained); USNM 222331, 1 male (47.5); FAKU 50335, 5 females (39.9–49.0); FAKU 50337, 4 males (39.2–51.9). Taiwan: USNM 222347, N = 83 of which 7 males (25.9–41.2), 7 females (20.6–39.8) were examined; USNM 222333, N = 3 (34.0–41.5); USNM 222322, N = 10 (14.0–32.8); USNM 222339, N = 13 (26.2–39.3); USNM 222326, N = 1 (29.5); USNM 222334, N = 1 (15.0); USNM 222319, N = 6 (27.0–36.0); USNM 222318, N = 1 (38.8); USNM 222328, N = 16 (18.2–35.0); USNM 222342, N = 8 (39.0–47.0); USNM 222337, N = 25 (21.0–43.5); Philippines: USNM 222323, N = 96 of which 10 males (30.1–37.7), 4 females (28.0–35.1) were examined. New Guinea: USNM 222341, 2 males (35.1, 33.8), 1 female (33.5).

## *Helcogramma hudsoni* (Jordan and Seale, 1906)

*Enneapterygius hudsoni* Jordan and Seale, 1906: 419, fig. 101 (type locality Samoa).
*Tripterygium gymnauchen* Weber, 1909: 149 (Timor, Indonesia); 1913: 548, fig. 119; De Beaufort and Chapman, 1951: 394; Jones and Kumaran, 1910: 192, fig. 2C (Kavarthi, Indian Ocean); Jones and Kumaran, 1980: 535, fig. 454.
*Tripterygium trigloides* (non Bleeker) Weber, 1913: 545, fig. 115 (Biliton, Philippines).
*Enneapterygius inclinatus* Fowler, 1946: 190, fig. 55 (type locality Aguni Shima, Ryu Kyu Islands).
*Tripterygion trigloides* (non Bleeker) de Beaufort and Chapman, 1951: 393 (Biliton, Lambeh Strait, Tiur—Philippines).
*Helcogramma hudsoni* Zama and Yasuda, 1979: 152, Pl. I,D (Chichi-jima, Ogasawara Islands).

*Comparison with Other Species.*—*Helcogramma hudsoni* sympatric with all *Helcogramma* except *H. billi, H. rhinoceros, H. decurrens* and *H. steinitzi. Helco-*

*gramma hudsoni* distinguished from all species by 3 central mandibular pores, other *Helcogramma with 1 or 2 central mandibular pores.*

*Description.*—Dorsal fin III, XII–XIV, 9–11 (usually 10); anal fin I, 17–20 (usually 19); nasal tentacle simple or bilobed; orbital tentacle simple, or absent; cephalic sensory pores moderately complex (Fig. 1e); mandibular pore series 4–5 + 3 + 4–5 (Fig. 2e); lateral-line pores 20–29 (mean varying with locality, Table 2b); lateral line ending under 12th–22nd dorsal fin elements; nape naked.

*Color Pattern.*—Live; based on Zama and Yasuda (1979) who made no mention of sexual dimorphism in coloration. Body light green with 8 dark transverse bands above axis of body; 4 below second dorsal fin, 2 below third dorsal fin, and 2 on caudal peduncle; a row of 8–9 dark blotches along lower margin of lateral line; head with dark band from tip of snout to eye; cheek and suborbital region orange; margins of dorsal fins dusky, first and second dorsal fins clear; third dorsal fin light pink; pectoral fin light yellow with dark blotch on lower base.

Preserved male with dark brown opercle below level of pterotic cephalic lateralis canal; dark, irregular blotches over sub-opercular region; chin, isthmus, pelvic fin, lower pectoral-fin base and belly with dark, scattered melanophores; pectoral fin with dark central blotch (on rays 3–9), and scattered melanophores over fin; dorsal fins with dusky margins; first dorsal fin with clear base, second and third dorsal fins with brown oblique bars, remainder clear; caudal and anal fin with brown oblique bars, remainder dusky-grey; body covered with scattered melanophores, dark pigment concentrated into 4–5 dark H-shaped bands, darker dorsally.

Preserved female and juvenile with the same body and fin coloration as male, but with little pigment on lower head, except for dark oblique band running from antero-ventral corner of eye over nare to upper lip.

*Measurements* (N = 10; 4 males, 4 females, 2 juveniles).—Head length 32.1 (30.4–33.3); eye diameter 10.5 (10.0–11.1); first dorsal-fin spine 10.1 (7.2–11.5); longest second dorsal-fin spine 16.0 (13.7–18.6); longest third dorsal-fin segmented ray 15.0 (13.7–17.8); seventh pectoral-fin ray 31.2 (27.0–33.8); upper jaw length 13.9 (12.6–15.1); longest pelvic-fin ray 23.9 (19.6–26.6).

*Remarks.*—*Helcogramma hudsoni* is widespread in the Indo-Pacific and is medium-sized for the genus (adults are 22.0–36.0 mm SL). It is possible that my concept of the species encompasses two species (separated by possession or lack of orbital tentacles) but this problem cannot be resolved until more specimens are available.

*Synonymy.*—The holotype of *H. hudsoni* is a female, 21.0 mm SL from Samoa, has the generalized color pattern typical of females in the genus *Helcogramma,* and has orbital tentacles. Zama and Yasuda (1979) noted the single lateral line found in *H. hudsoni,* and placed it in *Helcogramma.* Zama and Yasuda (1979) synonymized *Enneapterygius inclinatus* Fowler (1946) with *H. hudsoni,* noting that *H. hudsoni* from the Izu Islands has a minute orbital tentacle. I examined the holotype of *E. inclinatus* Fowler (1946); it is a male, 29.0 mm SL from the Ryukyu Islands, and agrees with *H. hudsoni* in counts and morphology, including possession of an orbital tentacle.

I examined the holotype of *Tripterygium* (=*Tripterygion*) *gymnauchen* Weber (1909); it is a female, 27.0 mm SL from Timor I., Indonesia and agrees in counts, morphology and color pattern with *H. hudsoni,* except that it lacks orbital tentacles. I also examined a specimen collected and identified by Weber (1899) as

*Tripterygium trigloides*; it is a female, 31.0 mm SL from the Banda Sea, and agrees with *H. hudsoni* in all characters but also has no orbital tentacles. Weber (1913) described and figured both *T. trigloides* and *T. gymnauchen*, not mentioning orbital tentacles, and distinguished them chiefly on the basis of color pattern. De Beaufort and Chapman 1951 described both *T. trigloides* from Biliton, Philippines and *T. gymnauchen* from Timor as lacking orbital tentacles, distinguishing them on the basis of color pattern and length of the first dorsal-fin spine. None of the above authors recorded the sex of their specimens.

I believe the differences found between *T. gymnauchen* Weber (1909; 1913), de Beaufort and Chapman (1951), and *T. trigloides* Weber (1913), de Beaufort and Chapman (1951) are sexual. Color pattern differences and differences in the length of the first dorsal spine are often found within the species of *Helcogramma*. I was not able to examine the specimens figured and described as *T. gymnauchen* by Jones and Kumaran (1970; 1980), but their description matches that of *T. gymnauchen* Weber (1909), except that they appear to have described male color pattern. No mention was made by Jones and Kumaran (1970; 1980) of an orbital tentacle or the sex of their specimens.

Until more specimens are available, I cannot determine if *H. hudsoni* is actually one species which is variable in the presence or absence of an orbital tentacle or if it is two separate species, one possessing and one lacking an orbital tentacle. It is the only species in the genus *Helcogramma* that is variable in this character.

*Material Examined* (N = 14).—Indonesia; Banda Sea, Tuir Island: ZMA 115.422 (identified by Weber as *T. trigloides*), 1 female (31.0); Timor Island: ZMA 112.509 (holotype of *T. gymnauchen*), 1 female (27.0). Australia; Northwest of Cape Arnhem: USNM 164591, 1 female (35.0); USNM 216562, 1 male (35.4). Pacific; Ryukyu Islands, Aguni Shima: ANSP 72067 (holotype of *E. inclinatus*), 1 male (32.0); Biniki Atoll: USNM 142264, 1 male (17.3); American Samoa: USNM 115519, 1 male (28.0); USNM 115518, 1 male (28.0), 2 juveniles (17.8, 19.0); USNM 51798 (holotype of *E. hudsoni*), 1 female (21.0); USNM 220064, 1 male (27.0); USNM 220063, 1 male (30.0), 1 female (31.2); Izu Islands: MTUF 22852, 1 female (29.0).

## *Helcogramma obtusirostris* Klunzinger, 1871

*Tripterygium obtusirostre* Klunzinger, 1871: 58 (type locality Red Sea).

*Enneapterygius personatus* Fowler, 1946: 185, figs. 48 and 49 (type locality Aguni Shima, Ryu Kyu Islands).

*Enneapterygius fuscipectoris* Fowler, 1946: 186, figs. 50 and 51 (type locality Aguni Shima, Ryu Kyu Islands).

*Enneapterygius quadrimaculatus* Fowler, 1946: 189, fig. 54 (Aguni Shima, Ryu Kyu Islands).

*Enneapterygius obtusirostre* (Klunzinger, 1871) J. L. B. Smith, 1949: 359, Pl. 82 (East Coast, South Africa); Clark et al., 1968: 23 (Dahlak Archipelago, Red Sea).

*Tripterygion personatus* Matsubara, 1955: 730.

*Tripterygion personatum* Fowler, 1958: 153, fig. 2 (Aguni Shima, Ryu Kyu Islands).

*Helcogramma shinglensis* Lal Mohan, 1971: 219, fig. 1 (type locality Gulf of Mannar, India).

*Helcogramma trigloides* (non Bleeker) Jones and Kumaran, 1980: 534, fig. 453 (Laccadives, Indian Ocean); Marshall, 1952: 242 (Mualla, Gulf of Aquaba).

*Helcogramma ascensionis* Lubbock, 1980: 294, fig. 2 (type locality Ascension Island).

*Helcogramma obtusirostre* Clark, 1980: 85, figs. 3e, 5b, 6b, 7 and Pl. I (Gulf of Elat, Ethiopia, Red Sea).

*Comparison with Other Species.*—*Helcogramma obtusirostris* sympatric with all *Helcogramma* except *H. capidata, H. decurrens* and *H. rhinoceros. Helcogramma obtusirostris* distinguished from *H. chica, H. springeri* and *H. striata*: *H. obtusirostris* with orbital tentacle, lacking in other three. *Helcogramma obtusirostris* without nape scales, *H. billi* with nape scales. Mandibular pore series of *H. obtusirostris*: 4–5, + 1 + 4–5, different from *H. hudsoni*: 4–5 + 3 + 4–5, *H. steinitzi* and *H. ellioti*: 3 + 1 + 3. *Helcogramma obtusirostris* distinguished from *H. fuscopinna*: occipital canal system complex in *H. fuscopinna* and simple in *H. obtusirostris* (Fig. 1).

*Description.*—Dorsal fin III, XII–XV (usually XIII–XIV), 9–12 (usually 10–11); anal fin I, 18–20 (usually 19); orbital tentacle simple; cephalic sensory pores may be simple or complex depending on locality (see geographic variation); mandibular pore series 4–5 + 1 + 4–5 (Fig. 2b); lateral-line pores 18–27 (mean varying with locality, Table 2b); lateral line ending under 17th–20th dorsal-fin elements; nape naked.

*Color Pattern.*—Live; based on Holleman (1979,[3] unpublished Master's thesis). Male with light brown body with 4–5 dark-H-shaped bars; bars blotched with irridescent blue; lower head, isthmus and pectoral-fin base black; dark pigment continuing in an elongate spot on lower 13 pectoral rays; large male with bright red patch basally on 2 dorsal-most and ventral-most pectoral-fin rays; pelvic fins bright red; nape deep red; snout and dorsal head area olive-green; upper lip and opercle with a brilliant blue stripe extending to just below ventral border of eye; upper lip with a patch of red on either side of midline; unpaired fins pale pink with uniformly distributed melanophores.

Live female and juvenile less colorful than male; body pale brown with dark brown to reddish H-shaped bars; head pale olive; nape rust; face with irregular brown patches.

Preserved male and female with light tan body with 4–5 dark H-shaped bars, first bar just posterior to pectoral-fin base, last on caudal peduncle; heads darker in both sexes; male with melanophores concentrated on lower opercle, chin and pelvic-fin base; pectoral-fin base dark, excluding 2 small immaculate patches on 2 dorsal-most and ventral-most fin-ray bases; large males with uniformly dusky unpaired fins; belly with scattered melanophores and melanophores concentrated around urogenital papilla; pelvic fins immaculate.

Female and juvenile with immaculate or faintly-barred unpaired fins and no melanophores around urogenital papilla; belly with scattered melanophores or without pigment; pelvic fins immaculate.

*Measurements* (N = 20; 10 males, 10 females).—Head length 30.2 (26.7–33.6); eye diameter 10.2 (7.8–12.7); seventh pectoral ray 30.6 (26.6–34.1); upper jaw length 13.3 (11.6–15.0); longest pelvic ray 24.2 (19.3–29.4).

*Geographic Variation.*—Geographic variation mainly occurs in males. Males from southeastern to southern Africa (specifically from Hully Pt. in Zululand to Coffee Bay in Transkei) have 2 distinct light patches on either side of the upper lip. These correspond with the red patches seen in life (Holleman, 1979[3]). These light patches are not found in specimens from other geographic areas. The specimens from Africa are also generally much darker, especially along the belly. Clark (1980, plate 1) showed a large male with similar pigmentation from the Red Sea. The cephalic sensory pores on large specimens (SL > 22.0 mm) from Zululand are complex whereas in specimens from other areas these pores are only moderately complex (Fig. 1b).

Most males from Sri Lanka have extremely dark and extended first dorsal-fin spines; these spines are 5–6% SL longer than those of specimens from other areas. Body coloration is different in males found near Trincomalee Bay in Sri Lanka;

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[3] Revision of S. African Tripterygiid Fishes (unpublished Master's thesis, Albany Museum, Grahamstown, RSA).

the anterior-most H-shaped bar present in males from other localities is missing, leaving the area from just behind the head to the middle of the second dorsal fin with very little pigment.

*Remarks.*—This species is widely distributed in the Indo-Pacific and is the only one in the genus known from Atlantic waters. It is medium-sized for the genus, adults ranging from 19.0–38.0 mm SL. The specific name, *obtusirostris*, is used as opposed to *obtusirostre*, as in previous literature, because *Helcogramma* is feminine and requires the feminine adjectival ending "is" rather than the neuter ending "re."

*Synonymy.*—Lal Mohan (1971) differentiated *Helcogramma shinglensis* only from *Tripterygion fasciatum* and *Helcogramma ellioti*. On the basis of the holotype of *H. shinglensis*, I determined that it is a synonym of *H. obtusirostris*. Several of my counts and measurements differ slightly from those recorded by Lal Mohan (1971) for the holotype and 3 paratypes of *H. shinglensis*. Most importantly, I counted I, 19 anal-fin rays in all 4 of Lal Mohan's type specimens (the last segmented ray was divided to the base in the holotype), where Lal Mohan recorded I, 20 anal-fin elements. Also, I counted 16 pectoral-fin rays in the holotype and in all but one of Lal Mohan's paratypes (a 13-mm specimen with 15 pectoral-fin rays). In the above counts and in all other characters, the holotype and paratypes of *H. shinglensis* agree with the description and holotype of *H. obtusirostris*. There is no previous record of *H. obtusirostris* from South India.

Fowler (1946) described three species, all of which I consider to be conspecific: *Enneapterygius personatus* (page 185), *Enneapterygius fiscipectoris* (page 186), *Enneapterygius quadrimaculatus* (page 191). He differentiated these three species on the basis of color pattern without realizing that, within species, male and female patterns are different. Rosenblatt (in Schultz 1960) synonymized *Enneapterygius personatus* with *Enneapterygius fuscipectoris*. I here synonymize all of Fowler's species mentioned above with *H. obtusirostris* on the basis of the holotypes. Specimens of *H. obtusirostris* from Southern Japan have higher anal-fin element counts (I, 20) than do specimens from other localities (I, 18–19). Fowler's types are from the Ryu Kyu Islands, and agree in all characters with *H. obtusirostris*, including anal-fin elements.

*Lectotype Designation.*—Klunzinger (1871) did not designate a holotype from among the 3 specimens from the Red Sea upon which he based his description of *H. obtusirostris*. I here designate the largest of Klunzinger's specimens, the only male (32.0 mm SL) with dorsal element count of III-XIII-II, as the lectotype. It is given the catalog number ZMB 31298.

*Material Examined* (N = 453).—Atlantic O.; Ascension I.: USNM 222355, N = 9 of which 3 males (20.0–30.2), 1 female (23.2) were examined; USNM 222356, 3 females (16.3–26.6); USNM 222353, N = 12 of which 1 male (31.7), 3 females (14.8–29.3), 2 juveniles (14.2, 15.5) were examined; USNM 222314, 1 juvenile (12.5); USNM 219405, 1 female (30.0) (paratype of *H. ascensionis*); St. Helena I: USNM 222352, 3 males (29.2–32.2), 4 females (28.9–30.1). Indian Ocean; South Africa: USNM 222354, 4 males (28.0–31.3), 4 females (28.9–31.2); Red Sea: USNM 205821, 1 male (16.6), 2 females (18.0, 20.0); ZMB 8020 (paralectotypes of *Tripterygium obtusirostre*), 2 males (26.2, 27.0); ZMB 31298 (lectotype of *Tripterygium obtusirostre*), 1 male (32.0); Aldabra Atoll: USNM 261389, N = 38 of which 1 male (30.3), 1 female (32.6) were examined; Tanzania, Latham I.: USNM 222358, 5 males (27.0–29.2) one of which (28.0) cleared and stained; USNM 222365, N = 21 of which 1 juvenile (14.0) cleared and stained; Cargados Carajos Shoals: USNM 222903, 1 female (26.9); USNM 222359, 6 males (27.0–33.1), 1 female (27.7); Comoro Is.: USNM 228984, 3 males (25.0–31.0), 4 females (24.1–32.2); CAS 33246, N = 24 (12.0–32.0); CAS 33040, N = 14 (22.3–29.2); CAS 33018, N = 1 (29.8); CAS 33245, N = 24 (13.2–34.0); CAS 33423, N = 82 (12.2–35.0); CAS 33765, N = 123 (10.2–33.0); Laccadive Islands: CMFRI-LA-F 194/382, 4 males (19.0–26.0), 4 females (21.0–24.0); Shingle

I. (Gulf of Mannar): CMFRI-T-101/1 (holotype of *H. shinglensis*), 1 male (26.6); Sri Lanka: USNM 222915, 3 males (22.5–23.8), 2 females (23.0, 23.8); USNM 222916, 3 males (21.5–23.8); USNM 222918, 1 male (23.5); USNM 222378, 1 male (24.5); USNM 222379, 8 males (25.5–30.0); USNM 222375, 1 male (28.2); USNM 228981, 3 males (23.2–26.7), 3 females (21.0–25.0). Indonesia; Thailand: USNM 222350, 2 males (21.3, 24.3); Sumatra: USNM 222917, 1 male (26.5); Ambon: BPBM 19306, 1 male (23.5), 1 female (24.3); Papua New Guinea: USNM 222360, 4 females (24.0–31.2). Pacific O.; Japan, Danjo Is.: FAKU 50314, 3 males (28.8–34.2); FAKU 50318, 3 females (26.0–30.0); Okinawa: USNM 228983, 1 male (31.7); Taiwan: USNM 228952, 1 male (26.7), 1 female (17.0); USNM 228933, 1 male (24.0); USNM 222311, N = 3 (30.5–31.0); Bikini Atoll: USNM 142264, 1 female (17.2); New Caledonia: BPBM 10844, 1 male (32.4); Ryu Kyu Is.: ANSP 72057, 1 male (22.0) (Holotype of *Enneapterygius personatus*); ANSP 72060, 1 male (22.0) (Holotype of *Enneapterygius fuscipectoris*); ANSP 72066, 1 female (20.0) (Holotype of *Enneapterygius quadrimaculatus*).

## ***Helcogramma rhinoceros*** new species
Figure 15

*Comparison with Other Species.*—*Helcogramma rhinoceros* sympatric with *H. chica, H. elliotі, H. fuscopinna, H. springeri* and *H. striata. Helcogramma rhinoceros* distinguished from *H. chica, H. springeri* and *H. striata*: *H. rhinoceros* with orbital tentacle other, species without. Mandibular pore series of *H. rhinoceros*: 4–5 + 1 + 4–5, different from *H. elliotі*: 3 + 1 + 3. *Helcogramma fuscopinna* with significantly more lateral-line scale tubes ($P < 0.01$ $\bar{x} = 24.3$) than *H. rhinoceros* ($\bar{x} = 19.6$), and where sympatric, *H. fuscopinna* with nape scales, *H. rhinoceros* without.

*Description.*—Dorsal fin III, XIV–XV (usually XV), 10–12 (usually 11); anal fin I, 19–21 (usually 20); orbital tentacle simple; cephalic sensory pores moderately complex (Fig. 1h); mandibular pore series 4–5 + 1 + 4–5 (Fig. 2h); lateral-line pores 18–21 (Table 2b); lateral line ending under 11th–13th dorsal-fin elements; nape naked.

*Color Pattern.*—Based on preserved specimens only. Male with dark flaplike extension on upper lip; black pigment below level of ventral border of eyes; dark chin, isthmus, pelvic-fin base and pelvic rays; pectoral-fin base dark, 7–9 ventralmost pectoral-fin rays dark; dorsal fins dusky, very dark at margins and with 5–6 dark spots at dorsal-fin base, largest spots at bases of 3rd and 18th–19th dorsal-fin elements; anal fin with 4 diffuse spots on base, on rays 2–4, 7–9, 12–14 and 17–19, remainder of fin light; body with 6 indistinct H-shaped bands, faded in most specimens and represented by 6 dark doublet-spots of pigment along the mid-lateral line; last bar on caudal peduncle most distinct, often appearing as a dark elongate diamond; caudal fin dusky, darker towards posterior border; belly dusky.

Preserved female and juvenile generally lighter; body with same pigment pattern as male; head without solid dark facial pigment; face with irregular scattered melanophores; diffuse band from antero-ventral edge of eye onto upper lip.

*Measurements* (N = 15; 12 males, 3 females).—Head length 31.4 (27.8–34.4); eye diameter 10.9 (9.3–14.4); second dorsal-fin base 34.3 (29.7–38.9); third dorsal-fin base 21.3 (18.5–23.7); anal-fin base 44.1 (41.5–47.8); upper jaw length 13.4 (12.0–14.8); distance P1-anal fin 27.1 (22.9–31.1); first dorsal-fin spine 15.4 (11.5–22.0); longest second dorsal-fin spine 14.6 (12.0–16.8); longest third dorsal-fin ray 12.9 (10.8–14.8); seventh pectoral-fin ray 31.1 (27.6–33.3).

*Remarks.*—*H. rhinoceros* is only known from the Philippines and Solomon Islands. It is a small species for the genus, adults being 17.0–29.0 mm SL. Males

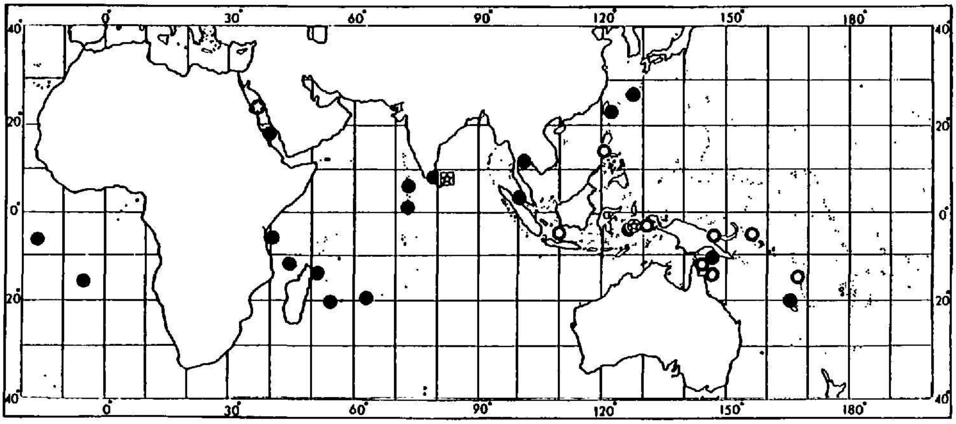

Figure 14. Distribution map of *Helcogramma obtusirostris* (solid circles), *H. billi* (square) and *H. springeri* (open circles). White stars indicate type localities.

greater than 25.0 mm SL have longer first dorsal spines (x̄ = 17.2–22.2% SL) than other specimens of this species (x̄ = 11.5–16.5% SL).

*Materials Examined* (N = 16).—HOLOTYPE: USNM 222370, male (27.0) from N.W. Putic Island, Palawan Province, Philippines (10°55′N, 121°02′E), collected by V. G. Springer, 22, V, '78. PARATYPES: (N = 15). Philippines: USNM 221917, 1 male (17.0), 4 females (18.5–26.0), same data as holotype, and 1 male (25.0) cleared and stained; USNM 221921, 3 males (17.5–29.0), 3 females (22.5–27.0), same data as holotype; USNM 221920, 2 males (25.2, 28.5) from Cocoro I., Cuyo Is., Sta. SP 78-26, collected by V. G. Springer, 26, V, 78, Solomon Ids: BPBM 16122, 1 male (21.5), from Savo Island, Southwest Side, collected by Randall.

*Etymology.*—Named *rhinoceros* because the prolongation of the upper lip of males is reminiscent of the snout horn of rhinoceri (Latin). The name rhinoceros is here used as a noun in apposition.

### ***Helcogramma springeri*** new species
### Figure 16

*Comparison with Other Species.*—*Helcogramma springeri* sympatric with *H. chica*, *H. ellioti*, *H. fuscopinna*, *H. hudsoni*, *H. obtusirostris* and *H. striata*. *Helcogramma springeri* distinguished from *H. ellioti*, *H. fuscopinna* and *H. obtusirostris*: *H. springeri* without orbital tentacle, latter three with orbital tentacle. *Helcogramma springeri* with one central mandibular pore, *H. hudsoni* with 3. *Helcogramma chica* with significantly more ($P < 0.01$ using Mann-Whitney *U*-test)

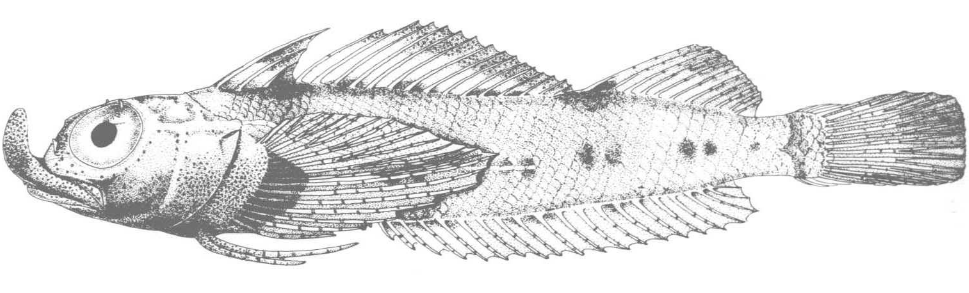

Figure 15. *Helcogramma rhinoceros*; male, 25.0 mm SL, paratype, USNM 221920.

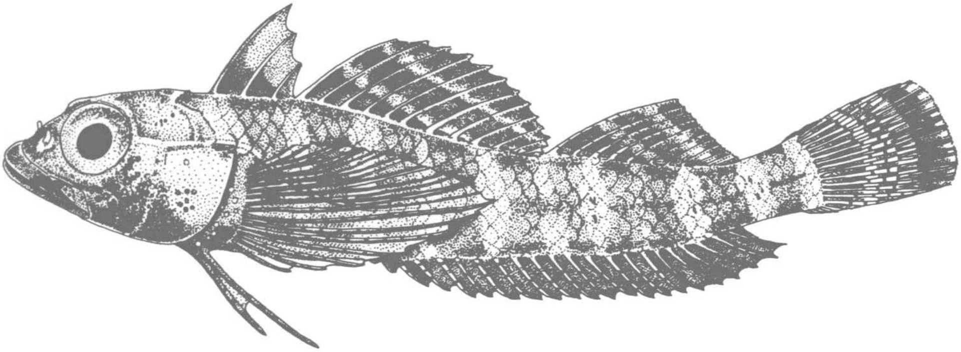

Figure 16. *Helcogramma springeri*; male, 28.0 mm SL, paratype, USNM 228903.

lateral-line scale tubes (range = 18–23) as opposed to *H. springeri* (range = 11–14). *Helcogramma springeri* without nape scales, *H. striata* with them.

*Description.*—Dorsal fin III, XII, 11; anal fin I, 19–20 (usually 19); orbital tentacle absent; cephalic sensory pores simple (Fig. 1e); mandibular pore series 3 + 1–2 + 3 (Fig. 2e); lateral-line pores 12–14 (usually 13; Table 2b); lateral line ending under 7th–10th dorsal-fin elements; nape naked.

*Color Pattern.*—Preserved specimens only. Male with darkly mottled lower head, chin, isthmus, pelvic fin and pectoral-fin base; light area under eye, above posterior edge of maxilla; cheek and upper lip pigmented with 4 dark blotches; one just below and posterior to eye, one below eye, two on upper lip; abdomen covered with scattered melanophores; anal fin uniformly dark; first dorsal fin darkly pigmented at base only, second and third dorsal fins with dark oblique bars; caudal and pectoral fins with faint bars; body light, with 5–6 H-shaped bars; first bar just after pectoral base, last on caudal peduncle.

Female and juvenile with lighter pigmentation; facial pigmentation similar to male, but in less concentrated dark blotches; isthmus without pigment posterior to vertical from posterior edge of maxilla; abdomen without pigment; body uniformly light tan, or with faint dark H-shaped bands as in male.

*Measurements* (N = 21; 13 males, 8 females).—Head length 33.9 (32.9–35.7); eye diameter 11.3 (10.4–12.7); second dorsal-fin base 33.6 (30.7–35.7); third dorsal-fin base 22.0 (19.3–23.3); anal-fin base 44.5 (42.8–46.7); distance P1-anal fin 21.8 (18.9–24.5); first dorsal-fin spine 14.8 (12.2–17.4); longest second dorsal-fin spine 16.1 (14.4–17.1); longest third dorsal-fin segmented ray 15.0 (13.7–15.8); seventh pectoral-fin ray 29.3 (27.4–32.0); upper jaw length 15.9 (14.7–17.5); longest pelvic-fin ray 24.4 (21.1–27.0).

*Remarks.*—*Helcogramma springeri* has been collected in the Philippines, Indonesia, New Guinea, New Hebrides, Queensland and the Solomon Islands (Fig. 4). It has a generalized pigment pattern for the genus except for the mottled face pigment in males. It is medium-sized for the genus, adults being 20.0–32.0 mm SL.

*Material Examined* (N = 44).—HOLOTYPE: USNM 229368, male (31.3) from Ambon, Moluccas, off Tandjung Suli, shallow coral reef, less than 2 m, collected by V. G. Springer, 11, I, '73. PARATYPES: (N = 43). Indonesia: USNM 228940, 1 male (26.4) same data as holotype; USNM 228903, 10 males (23.2–27.5), 12 females (14.0–26.0) Ceram, Moluccas, 0–3 m, collected by V. G. Springer, 10, I, '73; USNM 164600, 1 male (21.2) Netherlands Indies, collected by Longley, no date; USNM 210277, 1 male (26.0) northeast side of Ambon I., Moluccas, about 2 km east of Sawatelu, 0–10 m, collected

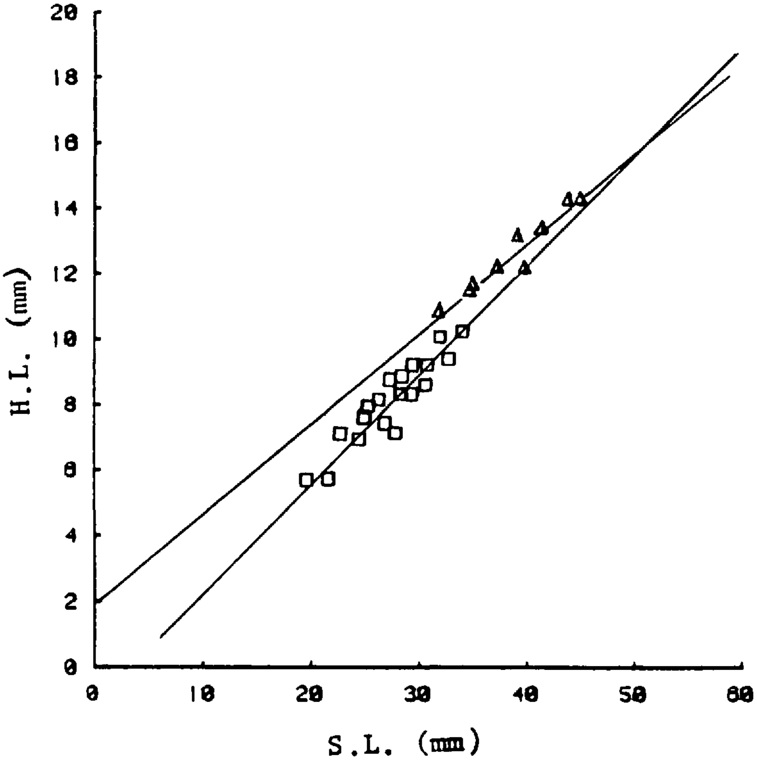

Figure 17. Linear regression of standard length (SL) vs. head length (HL) in two *Helcogramma* species. *Helcogramma steinitzi* = triangles, *H. obtusirostris* = squares. (Regression equations are significantly different, $P < 0.05$.)

by V. G. Springer, 8, I, '73; USNM 228935, 4 males (20.2–30.0), 1 female (27.6) Bawean I., VGS 74-27, 28, III, '74. Papua New Guinea: USNM 222349, 2 males (16.5, 21.0), 3 females (14.0–25.2), (01°09.5'S, 144°22.5'E); Hermit Island: USNM 222369, 1 female (24.0); USNM 263387, 1 male (19.0) Hermit I. (01°31'12"S 145°01'30"E), VGS 78-13; USNM 263388, 1 male (21.7) Hermit I. (01°33'S, 144°59'E), VGS 78-10. New Hebrides: USNM 150550, 1 female (24.4), Espiritu Santos Hbr., on coral heads, collected by W. Chapman et al., 23, IV, '44. Solomon Islands, Bougainville I.: USNM 222372, 1 male (27.0), "Te Vega" Cr. 6 Sta. 247. Philippines: USNM 228932, 1 male (22.5), 1 female (27.0) Pagnag taran pt., Sula Sea, Puerto Princesa, Palawan, 20–40 ft., 02, VII, '79; USNM 263389, 2 males (25.1, 27.5), Cuyo I. Palawan (10°51'12"N, 121°00'14"E) 0.6–1.2 m, VGS 78-17. Australia (Queensland): AMS I. 20774-012, N = 30 (20.0–33.0), reef off Cape Melville (14°56'S, 144°36'E), 2–8 m; AMS I. 22582-048, N = 3 (20.0–28.0), Escape reef, (11°43'S, 144°03'E), 14–17 m: AMS I. 20756-009, N = 4 (21.0–35.0), Raine Is. (11°43'S, 144°03'E); AMS I. 21451-001, N = 4 (50.0–56.0), One Tree Island; AMS I. 19483-072, N = 14 (20.0–31.0), McGillivray Reef (14°55'S, 145°27'E); AMS I. 19456-092, N = 14 (14.0–32.0), Yonge Reef (14°35'S, 145°36'E).

*Etymology.*—Named for Dr. Victor G. Springer, who collected most of the specimens I examined.

## *Helcogramma steinitzi* Clark, 1980

*Helcogramma steinitzi* Clark, 1980: 88, fig. 8, Pl. II–V (type locality Gulf of Elat).

*Comparison with Other Species.*—*H. steinitzi* sympatric with *H. obtusirostris*. *H. steinitzi* distinguished from that species: *H. steinitzi* with larger head length in

Table 3. Comparison of Distinguishing Characters in *Helcogramma* species

| | # Lateral-line tubes* | # Second dorsal-fin spines* | # Third dorsal-fin rays* | # Anal-fin rays* | Mandibular pore series | Occipital canal | Nape scales | Orbital tentacle |
|---|---|---|---|---|---|---|---|---|
| *H. billi* | 27–33, 29.86 | XIII–XIV, 13.14 | 9–11, 10.31 | 17–20, 19.05 | 2–3+1+2–3 | simple | present | present |
| *H. capidata* | 20–27, 23.25 | XIII–VI, 13.97 | 10–12, 10.96 | 19–21, 20.57 | 5–10+1+5–10 | simple | absent | absent |
| *H. chica* | 18–23, 20.59 | XIII–XVI, 14.28 | 9–12, 10.02 | 18–20, 19.05 | 3–4+1+3–4 | moderately complex | absent | absent |
| *H. decurrens* | 18–22, 20.05 | XII–XIV, 13.58 | 10–12, 10.74 | 17–21, 20.34 | 4–5+1+4–5 | complex | absent | present |
| *H. elliotti* | 22–37, 32.12 | XII–XV, 13.63 | 9–12, 10.67 | 17–22, 20.20 | 3+1+3 | moderately complex | absent | present |
| *H. fuscopinna* | 20–33, 24.30 | XIII–XVI, 14.18 | 10–12, 10.81 | 19–21, 20.29 | 5–7+1–2+5–7 | complex | absent or present | present |
| *H. hudsoni* | 20–26, 20.83 | XIII–XIV, 13.50 | 9–11, 10.08 | 18–19, 18.92 | 4–5+3+4–5 | moderately complex | absent | absent or present |
| *H. obtusirostris* | 19–24, 19.24 | XII–XV, 13.58 | 9–12, 10.62 | 18–20, 19.04 | 4–5+1+4–5 | moderately complex | absent | present |
| *H. rhinoceros* | 18–21, 19.57 | XIV–XV, 14.36 | 10–12, 10.47 | 19–21, 19.54 | 4–5+1+4–5 | moderately complex | absent | present |
| *H. steinitzi* | 21–27, 23.72 | XII–XIV, 13.02 | 10–12, 10.79 | 19–21, 19.87 | 3+1+3 | simple | present | present |
| *H. springeri* | 11–14, 13.06 | XIII, 13.00 | 11, 11.00 | 19–20, 19.80 | 3+1–2+3 | simple | absent | absent |
| *H. striata* | 14–20, 16.98 | XII–XV, 13.67 | 9–12, 10.89 | 17–23, 20.48 | 3+2+3 | simple | present | absent |

* Data given as: range, followed by mean.

relation to standard length, and larger total length than *H. obtusirostris* (Fig. 17), and *H. steinitzi* with nape scales. *H. steinitzi* with more anal rays than *H. obtusirostris* (Table 3).

*Description.*—Dorsal fin III, XII–XIV (usually XIII), 10–12 (usually 11); anal fin I, 19–21 (usually 19); orbital tentacle simple; cephalic sensory pores simple (Fig. 1k); mandibular pores series 3 + 1 + 3 (Fig. 2k); lateral-line pores 21–27 (usually 25); lateral-line ending under 16th–21st dorsal elements; nape scaled.

*Color Pattern.*—Freshly dead, based on Clark (1980). Large mature male, head reddish orange dorsally; lower ½–⅔ head, preopercle, pectoral-fin base, and thoracic region bluish black; iris bright orange with bluish black and green near rim; body orange tan with dusky irregular H-shaped bars, darker along mid-lateral line; posteriormost band on caudal peduncle, most conspicuous; wide dusky band along edge of third dorsal fin, and distal third anal fin; dusky spot on first dorsal fin between first and second spines; genital papilla of specimens greater than 28 mm SL surrounded with several dozen melanophores.

Female and juvenile pale orange with darker and more definite pattern than male; lower head pale with fewer melanophores; genital papilla of all specimens without pigment; pectoral and unpaired fins with dusky bars; pelvic fins without pigment.

Preserved specimens: same as above, but orange-red fades to yellow-tan.

*Measurements* (N = 10; 5 males, 5 females).—Head length 32.3 (30.7–33.4); eye diameter 9.9 (8.9–11.5); second dorsal-fin base 35.6 (33.4–37.1); third dorsal-fin base 20.1 (18.4–21.1); anal-fin base 44.5 (42.9–47.6); distance P1-anal 22.9 (22.3–23.4); first dorsal-fin spine 15.8 (14.4–18.7); longest second dorsal-fin spine 17.0 (16.0–18.7); seventh pectoral-fin ray 26.7 (25.0–27.7); upper jaw length 16.7 (15.6–17.1); longest pelvic-fin ray 26.0 (25.1–27.0).

*Remarks.*—This is a large species for the genus, adults being 20.0–47.0 mm SL. It is restricted to the Red Sea, and does not show significant geographic variation in meristics or color pattern.

*Material Examined* (N = 60).—N. Red Sea: USNM 205788 (paratypes), N = 2 (16.9, 35.0); USNM 205789 (paratypes), N = 5 (14.8–20.1); USNM 205790 (paratypes), N = 4 (18.0–46.8); USNM 205791 (paratypes), N = 12 (22.0–44.6); USNM 205792 (paratypes), N = 6 (29.1–41.5); USNM 205824 (paratypes), 4 males (26.8–37.0), 3 females (21.7–28.5); USNM 205833 (paratypes), 13 males (17.0–38.2), 4 females (19.5–37.5). Ethiopia: USNM 205826, 1 male (26.0); USNM 205828, 1 female (26.0); USNM 205830, 1 male (29.0); USNM 205832, 1 male (32.0).

## ***Helcogramma striata*** new species

Figure 18

*Comparison with Other Species.*—*Helcogramma striata* sympatric with all *Helcogramma* except *H. steinitzi, H. capidata* and *H. decurrens. Helcogramma striata* distinguished from *H. billi, H. ellioti, H. fuscopinna, H. obtusirostris* and *H. rhinoceros*: *H. striata* without orbital tentacles, latter five with orbital tentacles. *Helcogramma striata* distinguished from *H. springeri, H. hudsoni* and *H. chica*: *H. striata* with nape scales, latter three without. *Helcogramma striata* only *Helcogramma* with stripes on body (even small specimens retain stripes in preservation).

Dorsal fin III, XII–XV (usually XIV), 9–12 (usually 11); anal fin I, 17–23 (usually 20–21); orbital tentacle absent; cephalic sensory pores simple (Fig. 1a); mandibular pore series 3 + 2 + 3 (Fig. 2a); lateral-line pores 14–20 (mean varying with locality, Table 2b); lateral line ending under dorsal-fin elements 10–17; nape scaled.

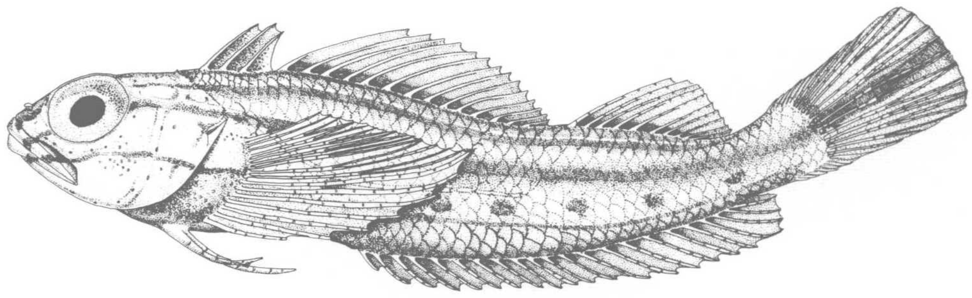

Figure 18. *Helcogramma striata*; male, 24.5 mm SL, paratype, USNM 221916.

*Color Pattern.*—Live based on Japanese specimens. Male and female alike; body and head red dorsally, green to dark blue ventrally; three longitudinal blue stripes on each side of body running from snout to caudal peduncle; dorsal-most stripe along 1st–2nd scale row, middle along 4th–5th scale row, and ventral-most along 7th–8th scale row (counting from dorsal fin); ventral-most stripe divides red dorsal region from the blue-green ventral region of the body; a row of 6–7 blue spots present between middle and ventral stripes just below lateral-line tubes and on caudal peduncle; lips red with diffuse blue spots corresponding with ends of stripes on snout.

Dorsal fins usually red, each with blue longitudinal stripe near base; first dorsal pale grey or blue; anal fin uniformly dark blue; pectoral fin uniformly light red, and caudal fin red with central blue stripe corresponding to middle body stripe; pelvic-fin rays red, membranes pink.

Specimens preserved in alcohol brown-black replaces blue-green of life color; tan replaces red: body and head light dorsally, body dark ventrally; three longitudinal stripes and row of spots that are blue in life and brown when preserved; lips light with dark spots corresponding with ends of stripes on snout; dorsal fins each clear-tan with dark stripe near base; anal fin uniformly darkly pigmented; caudal fin retains dark central stripe; pectoral and pelvic fins uniformly pale.

*Measurements* (N = 42; 21 males, 21 females).—Head length 30.6 (26.7–34.4); head depth 18.8 (15.6–21.7); head width 20.4 (15.7–25.0); snout length 8.3 (6.3–15.2); upper jaw length 12.9 (9.8–15.8); eye diameter 11.6 (9.8–13.4); second dorsal-fin base 31.7 (27.2–39.3); third dorsal-fin base 18.9 (16.7–23.6); anal-fin base 44.5 (41.7–52.9); distance P1-anal fin 21.6 (16.1–26.5); caudal peduncle length 11.8 (9.4–14.2); caudal peduncle depth 8.7 (7.3–14.2); first dorsal-fin spine 9.7 (7.0–12.5); longest second dorsal-fin spine 17.9 (12.6–21.5); longest third dorsal-fin ray 15.3 (10.9–19.6); seventh pectoral-fin ray 26.4 (22.3–30.2).

*Remarks.*—This is a widely distributed Indo-West Pacific species and is distinctive because of its bright, unique color pattern and lack of sexual dichromatism. It is medium-sized for the genus, adults being 25–43 mm SL with a blunter snout and larger eyes than most other species.

*Material Examined* (N = 130).—HOLOTYPE: USNM 221667, male (42.5) from Toga Pt. rocks, Miyake-jima, Japan (34°07′N, 139°30′E) rocky bottom 1–3 m, collected by P. Hadley, 10, VII, '77. PARATYPES: (N = 32) Japan: USNM 221668, 1 female (38.5) same data as holotype; USNM 221666, 1 male (28.0) Tokumasari reef, S. Okinawa (26°00′N, 117°45′E) 15 m, collected by J. E. Randall. Philippines: USNM 221669, 5 males (23.6–25.2), 4 females (23.0–25.6), Ajong, Negros I. (09°23′N, 123°15′13″E), 0–3 m, VGS 78-46. Taiwan: USNM 221916, 5 males (23.3–29.4), 6 females (25.0–35.0), Mao-Pi T'ou, southwest shore of island (21°55′N, 120°48′E), 10–15 m, rocky and coral bottom with deep canyons,

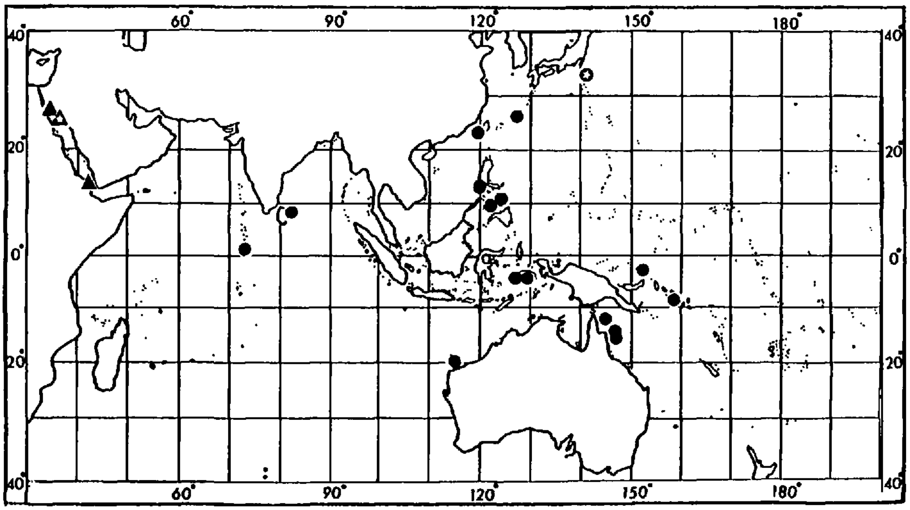

Figure 19. Distribution map of *Helcogramma striata* (circles) and *H. steinitzi* (triangles). White stars indicate type localities.

VGS 68-15, 3 specimens (23.0–33.0) removed for clearing and staining. Sri Lanka: USNM 263386, 5 males (18.1–25.5), 2 females (20.5, 21.0), Trincomalee Bay (08°33′N, 81°14′54″E), 15 ft., 6, X, '72. ADDITIONAL MATERIAL: (N = 82). Indian O., Sri Lanka: USNM 221928, 5 males (24.0–27.0), 6 females (22.0–24.5); USNM 221930, 1 female (23.5); Villingilli Is.: BPBM 18889, 1 male (26.3), 1 female (20.7). Indonesia; Ambon and New Guinea: USNM 221922, 4 females (22.4–24.3); USNM 221923, 1 female (25.0); USNM 221942, 1 male (25.9); USNM 221939, 2 males (20.0), 1 female (20.6); USNM 228948, 1 male (24.0). Pacific; Taiwan: USNM 221919, 5 males (21.5–30.0), 5 females (17.0–34.2); USNM 221924, 7 males (21.5–28.4), 3 females (31.6–31.8); USNM 221915, 4 males (20.5–34.5), 1 female (24.5); USNM 221918, 3 males (30.0–37.4), 3 females (9.2–32.4); Philippines: USNM 221927, 1 male (23.3); USNM 221925, 1 male (27.5); USNM 221929, 1 male (19.0), 1 female (22.6); USNM 224942, N = 6 (23.0–29.0); W. Australia: BPBM 17381, 3 males (21.5–28.5); Solomon Islands: USNM 221926, N = 8 of which 1 male (26.0), 4 females (20.0–24.6) were examined; BPBM 16037, 8 males (20.9–26.0); USNM 221931, 1 male (27.1), 3 females (15.5–26.0); Fanning Island: CAS 51500, 7 males (20.0–26.0), 2 females (12.0–13.0); Queensland: AMS I. 20756-007, 1 (21.0), Raine Is.; AMS I. 19456-093, N = 5 (13.0–24.0); Lizard Is.; AMS I. 19472-110, N = 14 (14.0–26.0), Yonge Reef; AMS I. 222619-024, 1 (28.0), Escape Reef.

*Etymology.* —Named *striata* in reference to the distinct striping on the body (Latin: stria=stripe).

## Species Inquirendum: *Helcogramma trigloides* (Bleeker, 1858)

I have not been able to locate any Bleeker specimens that could be considered a type of this species, and consider the type to be lost. It is not in the BMNH, London, the RNH, Leiden, or the ZMA, Amsterdam. There are no specimens of *Tripterygium trigloides* Bleeker, 1858 mentioned in the catalogue of Bleeker's collection (1879), and all the blennioids appear to have been bought by RNH, Leiden. Bleeker (1858) does not mention any type specimens in his original description, although he gives a length for a single specimen as 38 mm.

Among the plates that Bleeker prepared for his monumental *Atlas Ichtyologique*, there is a figure labelled *T. trigloides*. It is hand painted in water colors and approximately life-sized. It appears to be a male, although sex is not given. The head is dark brown in the opercular area and the lips have a pale stripe running from the posterior edge of the maxilla, under the eye, to the end of the preopercle.

The body is green-brown with 4–5 darker brown bars, and light spots, regularly scattered on its dorsal half. The first dorsal is dark, the second and third dorsals have dark oblique bands. The pectoral fin is orange-red with 3 dark bands; the anal fin is dark red-brown, and the caudal fin is greenish with 3 dark brown bands. Lateral-line scales are not clearly depicted on the illustration.

Bleeker's original description (1858) seems to be based on one specimen; he gives the counts as follows: "B.6. D. 3-13-10 omn. simpl. C. 2/9/2 et lat, brev, . . ." The lateral-line is described as having 50–55 scales, "in serie longitudinali"; no mention is made of pored lateral-line scales. Weber (1913) stated that he believed the count for anal elements of 10 must be a typographical error for 19. I agree with Weber because the figure has at least 19 anal fin elements. In addition, no tripterygiid species is known to have so few as 10 anal-fin elements. The number of scales in the lateral series was also mentioned by De Beaufort and Chapman (1951) as 50. It is not clear whether De Beaufort and Chapman were simply translating Bleeker's description (all the counts are identical and no range is given) or describing the counts from another specimen. In either case, the number of scales in the total lateral series exceeds the maximum number I have found in *Helcogramma* (37–42) by 8–13 scales. It is possible that a species exists that has a lateral line count this great and matches the color pattern which was described by Herre (1934) based on Bleeker's figure, although it may not be in the genus *Helcogramma.* I cannot be certain, however, that with some miscalculation or misprint in Bleeker's (1858) description of total lateral scales that *Helcogramma trigloides* is not a senior synonym of one of the species included in my study. The species that might be in jeopardy are *H. obtusirostris, H. hudsoni, H. ellioti* and *H. springeri*; all the remaining species can be excluded from identity with *H. trigloides* by features of their color pattern and distribution patterns.

In this paper, I have synonymized various specimens, identified as *Helcogramma trigloides* with other species. They are summarized as follows:

*Tripterygium trigloides* non Bleeker Weber, 1913 = *Helcogramma hudsoni* (Jordan and Seale, 1906).

*Tripterygion trigloides* non Bleeker De Beaufort and Chapman, 1951 = *Helcogramma hudsoni* (Jordan and Seale, 1906).

*Tripterygium trigloides* non Bleeker Day, 1888 = *Helcogramma ellioti* (Herre, 1944).

*Tripterygion trigloides* non Bleeker Jones and Kumaran, 1980 = *Helcogramma obtusirostris* (Klunzinger, 1871).

*Helcogramma trigloides* non Bleeker Marshall, 1952 = *Helcogramma obtusirostris* (Klunzinger, 1871).

The following accounts of *H. trigloides* seem to agree with Bleeker's (1858) description in lateral line count, and appear to be based on Bleeker's description. The lateral line is given as a single series, so I consider the name *Helcogramma trigloides* (Bleeker, 1858) as valid for the following:

*Tripterygium trigloides* Gunter, 1861: 279.

*Tripterygium trigloides* Herre, 1939: 318, 1933: 11, 1934: 95.

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